Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY
Tel. +49 (0)89 2399 - 0
Fax +49 (0)89 2399 - 4465

Parry, Simon James
Mewburn Ellis LLP
33 Gutter Lane
London
EC2V 8AS
ROYAUME UNI

For any questions about this communication:
Tel.:+31 (0)70 340 45 00

Date: 23.05.13

Reference	Application No./Patent No.
SJP/FP6724736	09731146.8 - 1910 / 2272259

Applicant/Proprietor: Koss Corporation

Communication regarding the expiry of the time limit within which notice of opposition may be filed

You are hereby informed that on expiry of the nine-month time limit from the publication of the mention of the grant of European patent No. 2272259 no notice of opposition had reached the files.

The entry in the Register of European Patents will be automatically generated by the electronic data processing system.

For the Examining Division

Europäisches Patentamt • European Patent Office • Office européen des brevets •

EPPU 02: 18.07.12 1910

EPO Form 2057 12.07

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY
Tel. +49 (0)89 2399 - 0
Fax +49 (0)89 2399 - 4465

For any questions about this communication:
Tel.:+31 (0)70 340 45 00

Parry, Simon James
Mewburn Ellis LLP
33 Gutter Lane
London
EC2V 8AS
ROYAUME UNI

Date
20.07.12

Reference	Application No./Patent No.
SJP/FP6724736	09731146.8 - 2225 / 2272259
Applicant/Proprietor	
Koss Corporation	

Transmission of the certificate for a European patent pursuant to Rule 74 EPC

The certificate for a European patent is herewith transmitted.

The European patent specification can be downloaded from the EPO publication server **https://data.epo.org/publication-server/** (see OJ EPO 2005, 126).

Note:
A corrected title page of the European patent specification will be published, if the bibliographic data have been changed after completion of the technical preparations.

For the Examining Division

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY
Tel. +49 (0)89 2399 - 0
Fax +49 (0)89 2399 - 4465

For any questions about this communication:
Tel.:+31 (0)70 340 45 00

Parry, Simon James
Mewburn Ellis LLP
33 Gutter Lane
London
EC2V 8AS
ROYAUME UNI

Date
21.06.12

Reference	Application No./Patent No.
SJP/FP6724736	09731146.8 - 2225 / 2272259
Applicant/Proprietor	
Koss Corporation	

Decision to grant a European patent pursuant to Article 97(1) EPC

Following examination of European patent application No. 09731146.8 a European patent with the title and the supporting documents indicated in the communication pursuant to Rule 71(3) EPC dated 02.02.12 is hereby granted in respect of the designated Contracting States.

Patent No. : 2272259
Date of filing : 07.04.09
Priority claimed : 07.04.08/USP 123265

Designated Contracting States and Proprietor(s) : AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR
Koss Corporation
4129 North Port Washington Road
Milwaukee, WI 53212/US

This decision will take effect on the date on which the European Patent Bulletin mentions the grant (Art. 97(3) EPC).

The mention of the grant will be published in European Patent Bulletin 12/29 of 18.07.12.

Examining Division

Moscu V Borowski M Righetti M

Europäisches Patentamt • European Patent Office • Office européen des brevets

ANMERKUNG ZUR ENTSCHEIDUNG ÜBER DIE ERTEILUNG
EINES EUROPÄISCHEN PATENTS (EPA Form 2006)

1. **EPA Informationsbroschüre "Nationales Recht zum EPÜ"**
Diese Broschüre enthält nützliche Informationen zu den formalen Erfordernissen und den Handlungen, die vor den Patentbehörden der Vertragsstaaten vorzunehmen sind, um Rechte in diesen Staaten zu erlangen. Da diese Handlungen einem ständigen Wandel unterworfen sind, sollte immer nur die neueste Ausgabe der Broschüre benutzt werden. Nachträgliche Informationen werden im Amtsblatt veröffentlicht.

2. **Übersetzung der europäischen Patentschrift nach Artikel 65 (1) des Europäischen Patentübereinkommens**
Sie werden erneut darauf hingewiesen, dass bestimmte Vertragsstaaten nach Artikel 65 (1) EPÜ eine Übersetzung der europäischen Patentschrift verlangen; hierauf wird in der Mitteilung gemäß Regel 71 (5) EPÜ verwiesen. Die Nichteinreichung dieser Übersetzung kann zur Folge haben, dass das Patent in dem betreffenden Staat/in den betreffenden Staaten als von Anfang an nicht eingetreten gilt. Weitere Einzelheiten entnehmen Sie bitte der oben genannten Broschüre.

3. **Zahlung von Jahresgebühren für europäische Patente**
Nach Artikel 141 EPÜ können "nationale" Jahresgebühren für das europäische Patent für die Jahre erhoben werden, die an das Jahr anschließen, in dem der Hinweis auf die Erteilung des europäischen Patents im "Europäischen Patentblatt" bekanntgemacht wird. Weitere Einzelheiten entnehmen Sie bitte der oben genannten Broschüre.

NOTE RELATING TO THE DECISION TO GRANT A
EUROPEAN PATENT (EPO Form 2006)

1. **EPO Information Brochure "National law relating to the EPC"**
This brochure provides useful information regarding formal requirements and the steps to be taken before the patent authorities of the Contracting States in order to acquire rights in those states. Since the necessary steps are subject to change the latest edition of the brochure should always be used. Subsequent information is published In the Official Journal.

2. **Translation of the European patent application under Article 65(1) of the European Patent Convention**
Your attention is again drawn to the requirements regarding translation of the European patent specification laid down by a number of Contracting States under Article 65(1) EPC, to which reference is made in the communication under Rule 71(5) EPC. Failure to supply such translation(s) may result in the patent being deemed to be void "ab initio" in the State(s) in question. For further details you are recommended to consult the above-mentioned brochure.

3. **Payment of renewal fees for European patents**
Under Article 141 EPC "national" renewal fees in respect of a European patent may be imposed for the years which follow that in which the mention of the grant of the European patent is published in the "European Patent Bulletin". For further details you are recommended to consult the above-mentioned brochure.

REMARQUE RELATIVE A LA DECISION DE DELIVRANCE
D'UN BREVET EUROPEEN (OEB Form 2006)

1. **Brochure d'information de l'OEB "Droit national relatif à la CBE"**
Cette brochure fournit d'utiles renseignements sur les conditions de forme requises et sur les actes à accomplir auprès des offices de brevet des Etats contractants aux fins d'obtenir des droits dans les Etats contractants. Etant donné que les actes indispensables sont susceptibles de modifications, il serait bon de toujours consulter la dernière édition de la brochure. Toute information ultérieure est publiée au Journal Officiel.

2. **Traduction du fascicule du brevet européen en vertu de l'article 65(1) de la Convention sur le brevet européen**
Votre attention est de nouveau attirée sur l'obligation faite par certains Etats contractants, en vertu de l'article 65(1) CBE, da fournir une traduction du fascicule du brevet européen, à laquelle il est fait référence dans la notification établie conformément à la règle 71(5) CBE. Si la(les) traduction(s) n'est(ne sont) pas fournie(s), le brevet européen peut, dès l'origine, être réputé sans effet dans cet(ces) Etat(s). Pour plus de détails, nous vous renvoyons à la brochure susmentionnée.

3. **Paiement des taxes annuelles pour le brevet européen**
Conformément à l'article 141 CBE des taxes annuelles "nationales" dues au titre du brevet européen peuvent être perçues pour les années suivant celle au cours de laquelle la mention de la délivrance du brevet européen est publiée au "Bulletin européen des brevets. Pour plus de détails, nous vous renvoyons à la brochure susmentionnée.

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	1682554
Application number	EP09731146.8
Date of receipt	08 June 2012
Receiving Office	European Patent Office, The Hague
Your reference	SJP/FP6724736
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (1 p.) CLMSTRAN-1.PDF\10580932-v1-To_EPO_-_08_06_2012_-_FR_claims.PDF (7 p.) ep-sfd-request.xml IGRA-1.PDF\10583698-v1-To_EPO_-_08_06_2012_-_Response_to_71(3).PDF (1 p.) CLMSTRAN-2.PDF\10580956-v1-To_EPO_-_08_06_2012_-_DE_claims.PDF (6 p.)
Submitted by	CN=S. Parry 20806,O=Mewburn Ellis LLP,C=GB
Method of submission	Online
Date and time receipt generated	08 June 2012, 16:48 (CEST)
Message Digest	DC:5E:2D:92:F2:51:F3:66:D7:E4:51:DF:D1:B7:64:F2:DC:9D:87:42

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

MewburnEllis
LLP

European Patent Attorneys
European Trade Mark Attorneys
European Design Attorneys
Chartered Patent Attorneys

33 Gutter Lane
London EC2V 8AS

Tel: +44 (0)20 7776 5300
Fax: +44 (0)20 7776 5399
mail@mewburn.com

Partners
Roger Calderbank
Patrick Stoner
Seán Walton
Nigel Hackney
Simon Kiddle
Adrian Brasnett
Roger Grimshaw
Simon Kremer
Joanna Cripps
Robert Watson
Christopher Denison
Nicholas Sutcliffe
Sofia Arenal
Matthew Naylor
Stephen Carter
Stephen Gill
Wilhelmus Wytenburg
Graham Forrest
Richard Clegg
Rachel Oxley
Rebecca Tollervey
Jeremy Webster
Richard Johnson
Hilary King
Lindsey Woolley
Simon Parry
Kerry Moroney
Sam Bailey
Graeme Moore
Stephen Hodsdon
Christopher Casley
Jonathan Wills

Qualified Staff
Robert Andrews
Julie Carlisle
Michael Foster
Rachel Gee
Katherine Green
Edmund Harrison
Susan Harrison
Emily Hayes
Sheila Hill
Sean Jauss
Tanis Keirstead
Nicola Kimblin
Andy King
James Leach
Joseph Lenthall
June Lyons
Stephen Michell
Kathryn Nicholls
Frances Salisbury
Matthew Smith
Ian Stuart
Laurence Toime
Rachel White

Consulting Partners
Ian Armitage
Hugh Paget

www.mewburn.com

European Patent Office
D-80298 München
Germany

BY EPO ONLINE FILING

8 June 2012

Dear Sirs

European Patent Application No. 09731146.8
Applicant: KOSS CORPORATION
Our Ref: SJP/FP6724736

In response to the Communication under Rule 71(3) dated 2 February 2012, we file herewith a translation of the claims into French and German.

The requisite grant and printing fees have been paid separately.

If these fees are incorrect please debit the necessary amount.

Yours faithfully

Simon James Parry
AUTHORISED REPRESENTATIVE
MEWBURN ELLIS LLP
simon.parry@mewburn.com

Encl. Claims translations (French and German)

SJP/pls

REVENDICATIONS

1. Écouteur comprenant:

un corps, dans lequel le corps comprend:

au moins un transducteur acoustique (106) pour convertir un signal électrique analogique en son;

une antenne (108); et

un circuit d'émission – réception (100) en communication avec ledit au moins un transducteur acoustique et l'antenne, dans lequel le circuit d'émission – réception est destiné à recevoir et à transmettre, par le biais de l'antenne, des signaux sans fil, et dans lequel le circuit d'émission – réception est destiné à générer en sortie le signal électrique analogique vers ledit au moins un transducteur acoustique, et dans lequel le circuit d'émission – réception sans fil comprend un micrologiciel, lequel, lorsqu'il est exécuté par le circuit d'émission – réception, amène le circuit d'émission – réception à:

recevoir, par voie radioélectrique, des données audio numériques à partir d'une source de données (20), par l'intermédiaire d'un réseau sans fil ad hoc (24), suite à l'établissement d'une liaison de communication sans fil avec le réseau sans fil ad hoc, et lorsque la source de données se situe dans une plage de communication sans fil avec l'écouteur, par l'intermédiaire du réseau sans fil ad hoc;

transmettre, par l'intermédiaire du réseau sans fil ad hoc, à la source de données, des données connexes à un ou plusieurs réseaux sans fil d'infrastructure détectés par le circuit d'émission – réception, qui présentent une puissance de signal supérieure à un niveau seuil de puissance de signal minimum, lorsque l'écouteur et la source de données communiquent par l'intermédiaire du réseau sans fil ad hoc, dans lequel les données comprennent des données d'identification pour ledit un ou lesdits plusieurs réseaux sans fil d'infrastructure; et

lorsque la source de données n'est pas située dans une plage de communication sans fil avec l'écouteur par l'intermédiaire du réseau sans fil ad hoc, mettre en œuvre une transition automatique en vue de recevoir des données audio numériques par l'intermédiaire d'un premier réseau sans fil d'infrastructure (33), l'écouteur étant caractérisé en ce que le circuit d'émission – réception reçoit des données audio numériques en provenance de la source de données via le premier réseau sans fil d'infrastructure, lorsque la source de données n'est pas située dans la plage de communication sans fil avec l'écouteur par l'intermédiaire du réseau sans fil ad hoc.

2. Écouteur selon la revendication 1, dans lequel le circuit d'émission – réception comprend:
un module de communication sans fil;
une unité de traitement en communication avec le module de communication sans fil;
une unité de mémoire non volatile en communication avec l'unité de traitement; et
une unité de mémoire volatile en communication avec l'unité de traitement.

3. Écouteur selon la revendication 2, dans lequel le module de communication sans fil comprend un module de communication WiFi.

4. Écouteur selon la revendication 1, dans lequel le micrologiciel, lorsqu'il est exécuté par le circuit d'émission – réception, amène le circuit d'émission – réception de l'écouteur à se connecter à un serveur hôte, par l'intermédiaire d'un second réseau sans fil d'infrastructure, lorsque (1) la source de données n'est pas située dans la plage de communication sans fil avec l'écouteur par l'intermédiaire du réseau sans fil ad hoc, et (2) la source de données et l'écouteur ne sont pas en communication sans fil via le premier réseau sans fil

d'infrastructure.

5. Écouteur selon la revendication 1, dans lequel le micrologiciel, lorsqu'il est exécuté par le circuit d'émission - réception, amène le circuit d'émission - réception de l'écouteur à se connecter à un serveur hôte par l'intermédiaire du réseau sans fil d'infrastructure, lorsque la source de données n'est pas située dans la plage de communication sans fil avec l'écouteur par l'intermédiaire du réseau sans fil ad hoc.

6. Écouteur selon la revendication 5, dans lequel l'écouteur est destiné à recevoir des données audio numériques diffusées en continu en provenance du serveur hôte par l'intermédiaire du réseau sans fil d'infrastructure.

7. Écouteur selon la revendication 5, dans lequel l'écouteur est destiné à recevoir une première adresse de réseau pour un premier serveur de contenu de données audio numériques diffusées en continu en provenance du serveur hôte par l'intermédiaire du réseau sans fil d'infrastructure.

8. Écouteur selon la revendication 7, dans lequel l'écouteur comporte une commande d'utilisateur qui, lorsqu'elle est actionnée, amène l'écouteur à soumettre une demande électronique, par l'intermédiaire du réseau sans fil d'infrastructure, au serveur hôte, concernant une seconde adresse de réseau d'un second serveur de contenu de données audio numériques diffusées en continu.

9. Écouteur selon la revendication 8, dans lequel la commande d'utilisateur comprend un bouton.

10. Système comprenant:
un écouteur sans fil selon la revendication 1; et
une dite source de données destinée à transmettre, par voie

hertzienne, des données audio numériques diffusées en continu.

11. Système selon la revendication 10, comprenant en outre un serveur hôte en communication avec l'écouteur sans fil, par l'intermédiaire du réseau sans fil d'infrastructure.

12. Système selon la revendication 11, dans lequel le micrologiciel du circuit d'émission – réception de l'écouteur sans fil, lorsqu'il est exécuté par le circuit d'émission – réception, amène le circuit d'émission – réception de l'écouteur à se connecter au serveur hôte par l'intermédiaire du réseau sans fil d'infrastructure, lorsque la source de données n'est pas située dans la plage de communication sans fil avec l'écouteur, par l'intermédiaire du réseau sans fil ad hoc.

13. Système selon la revendication 11, dans lequel le serveur hôte est destiné à diffuser en continu des données audio numériques vers l'écouteur, par l'intermédiaire du réseau sans fil d'infrastructure.

14. Système selon la revendication 11, dans lequel le serveur hôte est destiné à transmettre une première adresse de réseau d'un premier serveur de contenu de données audio numériques diffusées en continu à l'écouteur, par l'intermédiaire du réseau sans fil d'infrastructure.

15. Système selon la revendication 12, comprenant en outre une page web pour l'écouteur sans fil, à travers laquelle un utilisateur est apte à configurer un ou plusieurs paramètres de l'écouteur sans fil.

16. Système selon la revendication 10, ou écouteur selon la revendication 1, dans lequel la source de données comprend un lecteur de données audio numériques.

17. Système selon la revendication 10, ou écouteur selon la revendication 1, dans lequel le réseau sans fil d'infrastructure comprend un réseau local sans fil, WLAN.

18. Système selon la revendication 10, ou écouteur selon la revendication 1, dans lequel le réseau sans fil d'infrastructure est un réseau sans fil d'infrastructure prédéfini vers lequel la source de données transite lorsque la source de données n'est pas située dans la plage de communication sans fil avec l'écouteur, par l'intermédiaire du réseau sans fil ad hoc, et lorsque le réseau sans fil d'infrastructure prédéfini est situé dans la plage de communication de l'écouteur et de la source de données.

19. Procédé destiné à recevoir des données audio numériques sans fil par le biais d'un écouteur sans fil, l'écouteur sans fil comprenant:

un corps, dans lequel le corps comprend:

au moins un transducteur acoustique pour convertir un signal électrique analogique en son;

une antenne; et

un circuit d'émission - réception en communication avec ledit au moins un transducteur acoustique et l'antenne, dans lequel le circuit d'émission - réception est destiné à recevoir et à transmettre des signaux sans fil par l'intermédiaire de l'antenne; et

dans lequel le circuit d'émission - réception est destiné à générer en sortie le signal électrique analogique vers ledit au moins un transducteur acoustique; et

dans lequel le circuit d'émission - réception sans fil comprend un micrologiciel; et

dans lequel le procédé comprend les étapes ci-dessous consistant à, suite à l'établissement d'une liaison de communication sans fil avec un réseau sans fil ad hoc:

recevoir, par le biais de l'écouteur sans fil, par l'intermédiaire du réseau sans fil ad hoc, des données audio numériques en provenance d'une source de données,

lorsque la source de données est en communication sans fil avec l'écouteur par l'intermédiaire du réseau sans fil ad hoc;

transmettre, par le biais de l'écouteur sans fil, par l'intermédiaire du réseau sans fil ad hoc, à la source de données, des données connexes à un ou plusieurs réseaux sans fil d'infrastructure détectés par le circuit d'émission - réception, lesquelles présentent une puissance de signal supérieure à un niveau seuil de puissance de signal minimum, lorsque l'écouteur et la source de données communiquent par l'intermédiaire du réseau sans fil ad hoc, dans lequel les données comprennent des données d'identification pour ledit un ou lesdits plusieurs réseaux sans fil d'infrastructure;

convertir, par le biais de l'écouteur sans fil, les données audio numériques en son, le procédé étant caractérisé par les étapes ci-dessous consistant à:

lorsque la source de données n'est pas située dans la plage de communication sans fil avec l'écouteur, par l'intermédiaire du réseau sans fil ad hoc, mettre en œuvre une transition automatique, par l'écouteur, en vue de recevoir des données audio numériques via un premier réseau sans fil d'infrastructure, et recevoir des données audio numériques provenant de la source de données, via le premier réseau sans fil d'infrastructure, lorsque la source de données n'est pas située dans la plage de communication sans fil avec l'écouteur, par l'intermédiaire du réseau sans fil ad hoc.

20. Procédé selon la revendication 19, dans lequel l'étape de transition automatique, par l'écouteur, en vue de recevoir les données audio numériques par l'intermédiaire du premier réseau sans fil d'infrastructure, consiste à mettre en œuvre une transition automatique en vue de recevoir des données audio numériques à partir d'un serveur hôte par l'intermédiaire du premier réseau sans fil d'infrastructure, lorsque la source de données n'est pas

située dans la plage de communication sans fil avec l'écouteur par l'intermédiaire du réseau sans fil ad hoc.

21. Procédé selon la revendication 19, dans lequel l'étape de transition automatique, par l'écouteur, en vue de recevoir les données audio numériques par l'intermédiaire du premier réseau sans fil d'infrastructure, comprend les étapes ci-dessous consistant à:

recevoir, par le biais de l'écouteur sans fil, par l'intermédiaire du premier réseau sans fil d'infrastructure, à partir d'un serveur hôte connecté au premier réseau sans fil d'infrastructure, une adresse de réseau pour un serveur de contenu de données audio numériques diffusées en continu; et

se connecter, par le biais de l'écouteur sans fil, au serveur de contenu de données audio numériques diffusées en continu, en utilisant l'adresse de réseau reçue à partir du serveur hôte.

PATENTANSPRÜCHE

1. Kopfhörer, umfassend:

einen Körper, wobei der Körper Folgendes umfasst:

zumindest einen Schallwandler (106) zur Umwandlung eines analogen elektrischen Signals in Ton;

eine Antenne (108); und

eine Sendeempfängerschaltung (100) in Datenübertragungsverbindung mit dem zumindest einen Schallwandler und der Antenne, wobei die Sendeempfängerschaltung zum Empfangen und Senden von Funksignalen über die Antenne dient, und worin die Sendeempfängerschaltung zur Ausgabe des analogen elektrischen Signals an den zumindest einen Schallwandler dient, und worin die Funk-Sendeempfängerschaltung Firmware umfasst, die bei Ausführung durch die Sendeempfängerschaltung bewirkt, dass die Sendeempfängerschaltung

über Funk digitale Audiosignale von einer Datenquelle (20) über ein Ad-hoc-Funknetz (24) empfängt, nachdem eine Funkdatenübertragungsverbindung mit dem Ad-hoc-Funknetz hergestellt wurde und wenn sich die Datenquelle in Funkdatenübertragungsreichweite des Kopfhörers über das Ad-hoc-Funknetz befindet;

über das Ad-hoc-Funknetz Daten bezüglich eines oder mehrerer, durch die Sendeempfängerschaltung detektierter Infrastruktur-Funknetze, die eine Signalstärke über einem minimalen Signalstärken-Schwellenwert aufweisen, an die Datenquelle überträgt, wenn der Kopfhörer und die Datenquelle über das Ad-hoc-Funknetz Daten austauschen, wobei die Daten Identifikationsdaten für eines oder mehrere Infrastruktur-Funknetze umfassen; und,

wenn die Datenquelle sich nicht in Funkdatenübertragungsreichweite des Kopfhörers über das Ad-hoc-Funknetz befindet, automatisch zum Empfang von digitalen Audiosignalen über ein erstes Infrastruktur-Funknetz (33) wechselt, wobei der Kopfhörer dadurch gekennzeichnet, dass die Sendeempfängerschaltung digitale Audiosignale von der Datenquelle über das erste Infrastruktur-Funknetz empfängt, wenn die Datenquelle sich nicht in Funkdatenübertragungsreichweite des Kopfhörers über das Ad-hoc-Funknetz befindet.

2. Kopfhörer nach Anspruch 1, wobei die Sendeempfängerschaltung Folgendes umfasst:

ein Funkdatenübertragungsmodul;

eine Verarbeitungseinheit in Datenübertragungsverbindung mit dem Funkdatenübertragungsmodul;

eine nichtflüchtige Speichereinheit in Datenübertragungsverbindung mit der Prozessoreinheit; und

eine flüchtige Speichereinheit in Datenübertragungsverbindung mit der Prozessoreinheit.

3. Kopfhörer nach Anspruch 2, wobei das Funkdatenübertragungsmodul ein WLAN-Datenübertragungsmodul umfasst.

4. Kopfhörer nach Anspruch 1, wobei die Firmware bei Ausführung durch die Sendeempfängerschaltung bewirkt, dass die Sendeempfängerschaltung des Kopfhörers sich über ein zweites Infrastruktur-Funknetz mit einem Host-Server verbindet, wenn (1) die Datenquelle sich nicht im Funkdatenübertragungsbereich des Kopfhörers über das Ad-hoc-Funknetz befindet und (2) die Datenquelle und der Kopfhörer sich nicht in Funkdatenübertragung mit dem ersten Infrastruktur-Funknetz befinden.

5. Kopfhörer nach Anspruch 1, wobei die Firmware bei Ausführung durch die Sendeempfängerschaltung bewirkt, dass die Sendeempfängerschaltung des Kopfhörers sich über das Infrastruktur-Funknetz mit einem Host-Server verbindet, wenn die Datenquelle sich nicht in Funkdatenübertragungsreichweite des Kopfhörers über das Ad-hoc-Funknetz befindet.

6. Kopfhörer nach Anspruch 5, wobei der Kopfhörer zum Empfangen eines digitalen Audiodatenstroms vom Host-Server über das Infrastruktur-Funknetz ausgebildet ist.

7. Kopfhörer nach Anspruch 5, wobei der Kopfhörer zum Empfangen einer ersten Netzwerkadresse für einen ersten, einen digitalen Audioinhalt-Datenstrom aussendenden Server vom Host-Server über das Infrastruktur-Funknetz dient.

8. Kopfhörer nach Anspruch 7, wobei der Kopfhörer eine Benutzersteuerung umfasst, die bei Aktivierung dazu führt, dass der Kopfhörer über das Infrastruktur-Funknetz eine elektronische Anfrage bezüglich einer zweiten Netzwerkadresse für einen zweiten, einen digitalen Audioinhalt-Datenstrom aussendenden Server an den Host-Server sendet.

9. Kopfhörer nach Anspruch 8, wobei die Benutzersteuerung einen Knopf umfasst.

10. System, umfassend:
einen Funkkopfhörer nach Anspruch 1; und
die Datenquelle zur Funkübertragung eines digitalen Audiodatenstroms.

11. System nach Anspruch 10, das weiters einen Host-Server umfasst, der über das Infrastruktur-Funknetz in Datenübertragungsverbindung mit dem Funkkopfhörer steht.

12. System nach Anspruch 11, wobei die Firmware der Sendeempfängerschaltung des Funkkopfhörers bei Ausführung durch die Sendeempfängerschaltung bewirkt, dass die Sendeempfängerschaltung des Kopfhörers sich über das Infrastruktur-Funknetz mit dem Host-Server verbindet, wenn die Datenquelle sich nicht in Funkdatenübertragungsreichweite des Kopfhörers über das Ad-hoc-Funknetz befindet.

13. System nach Anspruch 11, wobei der Host-Server zum Streamen von digitalen Audiodaten zum Kopfhörer über das Infrastruktur-Funknetz dient.

14. System nach Anspruch 11, wobei der Host-Server zur Übertragung einer ersten Netzwerkadresse für einen ersten, einen digitalen Audioinhalt-Datenstrom aussendenden Server zum Kopfhörer über das Infrastruktur-Funknetz dient.

15. System nach Anspruch 12, das weiters eine Webseite für einen Funkkopfhörer umfasst, über welche ein Benutzer eine oder mehrere Einstellungen für den Funkkopfhörer konfigurieren kann.

16. System nach Anspruch 10 oder Kopfhörer nach Anspruch 1, wobei die Datenquelle einen digitalen Audioabspieler umfasst.

17. System nach Anspruch 10 oder Kopfhörer nach Anspruch 1, wobei das Infrastruktur-Funknetz ein WLAN umfasst.

18. System nach Anspruch 10 oder Kopfhörer nach Anspruch 1, wobei das Infrastruktur-Funknetz ein voreingestelltes Infrastruktur-Funknetz ist, auf das die Datenquelle umschaltet, wenn die Datenquelle sich nicht in Funkdatenübertragungsreichweite des Kopfhörers über das Ad-hoc-Funknetz befindet und wenn das voreingestellte Infrastruktur-Funknetz sich in Reichweite von sowohl dem Kopfhörer als auch der Datenquelle befindet.

19. Verfahren zum Empfangen eines digitalen Funkaudiosignals über einen Funkkopfhörer, wobei der Funkkopfhörer Folgendes umfasst:

einen Körper, wobei der Körper Folgendes umfasst:

zumindest einen Schallwandler zur Umwandlung eines analogen elektrischen Signals in Ton; eine Antenne; und

eine Sendeempfängerschaltung in Datenübertragungsverbindung mit dem zumindest einen Schallwandler und der Antenne, wobei die Sendeempfängerschaltung zum Empfangen und Senden von Funksignalen über die Antenne dient, und

worin die Sendeempfängerschaltung zur Ausgabe des analogen elektrischen Signals an den zumindest einen Schallwandler dient, und

worin die Funk-Sendeempfängerschaltung Firmware umfasst, und

worin das Verfahren Folgendes umfasst: nach der Herstellung einer Funkdatenübertragungsverbindung mit einem Ad-hoc-Funknetz,

das Empfangen von digitalen Audiosignalen von einer Datenquelle durch den Funkkopfhörer über das Ad-hoc-Funknetz, wenn sich die Datenquelle in Funkdatenübertragungsverbindung mit dem Kopfhörer über das Ad-hoc-Funknetz befindet;

das Übertragen von Daten bezüglich eines oder mehrerer, durch die Sendeempfängerschaltung detektierter Infrastruktur-Funknetze, die eine Signalstärke über einem minimalen Signalstärken-Schwellenwert aufweisen, durch den Funkkopfhörer über das Ad-hoc-Funknetz an die Datenquelle, wenn der Kopfhörer und die Datenquelle über das Ad-hoc-Funknetz Daten austauschen, wobei die Daten Identifikationsdaten für eines oder mehrere Infrastruktur-Funknetze umfassen;

Umwandeln der digitalen Audiosignale in Ton durch den Funkkopfhörer, wobei das Verfahren dadurch gekennzeichnet, dass:

wenn die Datenquelle sich nicht in Funkdatenübertragungsreichweite des Kopfhörers über das Ad-hoc-Funknetz befindet, der Kopfhörer automatisch zum Empfang von digitalen Audiosignalen über ein erstes Infrastruktur-Funknetz wechselt und digitale Audiosignale von der Datenquelle über das erste Infrastruktur-Funknetz empfängt, wenn die Datenquelle sich nicht in Funkdatenübertragungsreichweite des Kopfhörers über das Ad-hoc-Funknetz befindet.

20. Verfahren nach Anspruch 19, worin das automatische Wechseln des Kopfhörers zum Empfangen von digitalen Audiosignalen über das erste Infrastruktur-Funknetz das automatische Wechseln zum Empfangen von digitalen Audiosignalen von einem Host-Server über das erste Infrastruktur-Funknetz umfassen, wenn die Datenquelle sich nicht in Funkdatenübertragungsreichweite des Kopfhörers über das Ad-hoc-Funknetz befindet.

21. Verfahren nach Anspruch 19, worin das automatische Wechseln des Kopfhörers zum Empfangen von digitalen Audiosignalen über das erste Infrastruktur-Funknetz Folgendes umfasst:

das Empfangen einer Netzwerkadresse für einen ersten, einen digitalen Audioinhalt-Datenstrom aussendenden Server von einem Host-Server, der mit dem ersten Infrastruktur-Funknetz verbunden ist, durch den Funkkopfhörer über das erste Infrastruktur-Funknetz; und

das Verbinden mit dem einen digitalen Audioinhalt-Datenstrom aussendenden Server durch den Funkkopfhörer unter Verwendung der vom Host-Server erhaltenen Netzwerkadresse.

Europäisches Patentamt
European Patent Office
Office européen des brevets

Letter accompanying subsequently filed items

Sender:

Mr Simon PARRY
Mewburn Ellis LLP
33 Gutter Lane
London Greater London EC2V 8AS
United Kingdom

Phone: +44 20 7776 5300
Fax: +44 20 7776 5399
E-mail: mail@mewburn.com

80298 Munich
Germany
Tel. +49(0)89 2399-0 | Fax -4465

P.O. Box 5818
NL-2280 HV Rijswijk
Netherlands
Tel. +31(0)70 340-2040 | Fax -3016

10958 Berlin
Germany
Tel. +49(0)30 25901-0 | Fax -840

The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	09731146.8
Applicant's or representative's reference	SJP/FP6724736

	Description of document	Original file name	Assigned file name
1	Reply to the communication under rule 71(3) EPC	10583698-v1-To_EPO_-_08_06_2012_-_Response_to_71(3).PDF	IGRA-1.PDF
2	Translation of claims	10580932-v1-To_EPO_-_08_06_2012_-_FR_claims.PDF	CLMSTRAN-1.PDF
3	Translation of claims	10580956-v1-To_EPO_-_08_06_2012_-_DE_claims.PDF	CLMSTRAN-2.PDF

Annotations

Precautionary statement regarding deposit account instructions(MEWBURN ELLIS LLP; 08.06.2012)
1. Remark(Annotate)
If this form or any document attached to it includes an instruction to debit one or more fees from our deposit account and if the EPO believes that the amount listed above for the fee or fees indicated to be paid is insufficient, the EPO is hereby authorised to debit the correct amount.

Signatures

Place:
Date: **08 June 2012**
Signed by: **GB, Mewburn Ellis LLP, S. Parry 20806**
Capacity: **(Representative)**

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	1543083
Application number	EP09731146.8
Date of receipt	14 March 2012
Receiving Office	European Patent Office, The Hague
Your reference	SJP/FP6724736
Applicant	All applicants as on file
Documents submitted	package-data.xml epf1038.pdf (1 p.) ep-sfd-request.xml FEES-1.PDF\10359075-v1-to_EPO_14_Mar_2012_paying_grant_fee.PDF (1 p.)
Submitted by	CN=S. Parry 20806,O=Mewburn Ellis LLP,C=GB
Method of submission	Online
Date and time receipt generated	14 March 2012, 15:53 (CET)
Message Digest	BF:CC:88:57:60:AB:80:3C:DF:E8:3A:A9:6A:E1:2B:6B:00:AC:0E:B8

Correction by the EPO of errors in debit instructions filed by eOLF
Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

Europäisches Patentamt
European Patent Office
Office européen des brevets

Letter accompanying subsequently filed items

Sender:
Simon Parry
Mewburn Ellis LLP
33 Gutter Lane
London Greater London EC2V 8AS
United Kingdom

Phone: +44 161 247 7722
Fax: +44 20 7776 5399
E-mail: mail@mewburn.com

80298 Munich
Germany
Tel. +49(0)89 2399-0 | Fax -4465

P.O. Box 5818
NL-2280 HV Rijswijk
Netherlands
Tel. +31(0)70 340-2040 | Fax -3016

10958 Berlin
Germany
Tel. +49(0)30 25901-0 | Fax -840

The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	09731146.8
Applicant's or representative's reference	SJP/FP6724736

	Description of document	Original file name	Assigned file name
1	Document concerning fees and payments	10359075-v1-to_EPO_14_Mar_2012_paying_grant_fee.PDF	FEES-1.PDF

Signatures

Place:

Date: **14 March 2012**

Signed by: **GB, Mewburn Ellis LLP, S. Parry 20806**

Capacity: **(Representative)**

MewburnEllis
LLP

European Patent Attorneys
European Trade Mark Attorneys
European Design Attorneys
Chartered Patent Attorneys

33 Gutter Lane
London EC2V 8AS

Tel: +44 (0)20 7776 5300
Fax: +44 (0)20 7776 5399
mail@mewburn.com

Partners
Hugh Paget
Roger Calderbank
Patrick Stoner
Seán Walton
Nigel Hackney
Simon Kiddle
Adrian Brasnett
Roger Grimshaw
Simon Kremer
Joanna Cripps
Robert Watson
Christopher Denison
Nicholas Sutcliffe
Sofia Arenal
Matthew Naylor
Stephen Carter
Stephen Gill
Wilhelmus Wytenburg
Graham Forrest
Richard Clegg
Rachel Oxley
Rebecca Tollervey
Jeremy Webster
Richard Johnson
Hilary King
Lindsey Woolley
Simon Parry
Kerry Moroney
Sam Bailey
Graeme Moore
Stephen Hodsdon
Christopher Casley

Qualified Staff
Robert Andrews
Julie Carlisle
Michael Foster
Rachel Gee
Katherine Green
Edmund Harrison
Susan Harrison
Emily Hayes
Sheila Hill
Sean Jauss
Tanis Keirstead
Nicola Kimblin
Andy King
James Leach
Joseph Lenthall
June Lyons
Stephen Michell
Kathryn Nicholls
Frances Salisbury
Matthew Smith
Ian Stuart
Rachel White
Jonathan Wills

Consulting Partner
Ian Armitage

www.mewburn.com

European Patent Office
D-80298 München
GERMANY

14 March 2012

BY EPO ONLINE FILING

Dear Sirs

European Patent Application No. 09731146.8
Applicant: KOSS CORPORATION
Our Ref: SJP/FP6724736

In partial response to the official Communication under Rule 71(3) EPC dated 2 February 2012, I hereby ask that you debit the official grant fee (believed to be EUR 830) from my firm's deposit account no. 2805.0013 under reference no 32569.

The French and German translations of the claims will be filed subsequently.

Yours faithfully

Simon Parry
AUTHORISED REPRESENTATIVE
MEWBURN ELLIS LLP
Tel: +44 161 247 7722
Email: simon.parry@mewburn.com

SJP/JLS

MewburnEllis
LLP

European Patent Attorneys
European Trade Mark Attorneys
European Design Attorneys
Chartered Patent Attorneys

33 Gutter Lane
London EC2V 8AS

Tel: +44 (0)20 7776 5300
Fax: +44 (0)20 7776 5399
mail@mewburn.com

Partners
Hugh Paget
Roger Calderbank
Patrick Stoner
Seán Walton
Nigel Hackney
Simon Kiddle
Adrian Brasnett
Roger Grimshaw
Simon Kremer
Joanna Cripps
Robert Watson
Christopher Denison
Nicholas Sutcliffe
Sofia Arenal
Matthew Naylor
Stephen Carter
Stephen Gill
Wilhelmus Wytenburg
Graham Forrest
Richard Clegg
Rachel Oxley
Rebecca Tollervey
Jeremy Webster
Richard Johnson
Hilary King
Lindsey Wooiley
Simon Parry
Kerry Moroney
Sam Bailey
Graeme Moore
Stephen Hodsdon
Christopher Casley

Qualified Staff
Robert Andrews
Julie Carlisle
Michael Foster
Rachel Gee
Katherine Green
Edmund Harrison
Susan Harrison
Emily Hayes
Sheila Hill
Sean Jauss
Tanis Keirstead
Andy King
James Leach
Joseph Lenthall
June Lyons
Stephen Michell
Kathryn Nicholls
Matthew Smith
Ian Stuart
Rachel White
Jonathan Wills

Consulting Partner
Ian Armitage

www.mewburn.com

EUROPEAN PATENT OFFICE
Erhardtstrasse 27
D-80298 München
GERMANY

EPO - Munich
7
15. Feb. 2012

08 February 2012

Dear Sirs

European Patent Application No. : 09731146.8
Applicant : KOSS CORPORATION
Our Ref : 6724736.EPG

Please supply the certificate for the European Patent, when granted, for the or/each proprietor, with a copy of the patent specification. This request is made in accordance with the EPO notice of 22 December 2004 concerning electronic publications.

Yours faithfully

AUTHORISED REPRESENTATIVE
MEWBURN ELLIS LLP

G. R. Forrest

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY
Tel: +49 89 2399 0
Fax: +49 89 2399 4465

Annex to EPO Form 2004, Communication pursuant to Rule 71(3) EPC

Bibliographical data of European patent application No. 09 731 146.8

For the intended grant of the European patent, the bibliographical data are set out below, for information:

Title of invention:
- DRAHTLOSER KOPFHÖRER MIT ÜBERGANG ZWISCHEN DRAHTLOSEN NETZWERKEN
- WIRELESS EARPHONE THAT TRANSITIONS BETWEEN WIRELESS NETWORKS
- ÉCOUTEUR SANS FIL QUI EFFECTUE DES TRANSITIONS ENTRE DES RÉSEAUX SANS FIL

Classification: INV. H04R1/02

Date of filing: 07.04.2009

Priority claimed: US / 07.04.2008 / USP123265

Contracting States* for which fees have been paid: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR

Extension States* for which fees have been paid:

Applicant(s):**

Koss Corporation
4129 North Port Washington Road
Milwaukee, WI 53212
US

Inventor(s):

PELLAND, Michael, J.
N 4626 Wildwood Lane
Princeton
WI 54968-8738
US

KOSS, Michael, J.
2800 West Bradley Road
Milwaukee
WI 53217
US

SAGAN, Michael
598 Woodberry Street
Marshall
WI 53559
US

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY
Tel: +49 89 2399 0
Fax: +49 89 2399 4465

RECKAMP, Steven
1158 Atcheson Avenue
Sun Prairie
WI 53590-3812
US

*)	If the time limit for the payment of designation fees according to Rule 39(1) EPC has not yet expired and the applicant has not withdrawn any designation, **all Contracting States/Extension States** are currently still deemed to be designated. See also Rule 71(8) EPC and, if applicable, the above Note to users of the automatic debiting procedure.
**)	If two or more applicants have designated different Contracting States, this is indicated here.

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY
Tel: +49 89 2399 0
Fax: +49 89 2399 4465

Parry, Simon James
Mewburn Ellis LLP
33 Gutter Lane
London
EC2V 8AS
ROYAUME-UNI

Formalities Officer
Name: Peter, Nicole
Tel: +49 89 2399 - 4252
or call
+31 (0)70 340 45 00

Application No.	Ref.	Date
09 731 146.8 - 2225	SJP/FP6724736	02.02.2012
Applicant: Koss Corporation		

Communication under Rule 71(3) EPC

You are informed that the Examining Division intends to grant a European patent on the basis of the above application with the text and drawings as indicated below:

In the text for the Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR

Description, Pages

2-21	as published			
1, 1a	received on	30-11-2011	with letter of	30-11-2011

Claims, Numbers

1-21	received on	30-11-2011	with letter of	30-11-2011

Drawings, Sheets

1/16-16/16	as published

With the following amendments to the above-mentioned documents by the division

Description, Pages	1, 3, 4, 21
Claims, Numbers	1, 19

Comments

- inclusion by reference is not allowed and therefore the corresponding expressions have been removed from pages 1,3,4,
- general statement was removed from page 21, GL C-III 4.4.
- reference signs have been introduced in claim 1 to increase the intelligibility, Rule 43(7) EPC.
- the wording of claim 1 and 19 regarding the expression "transmit data ...."has been rearranged to increase the clarity of the claims, article 84 EPC.
- in claim 1, the transceiver circuit is not just **for receiving**... (interpreted as suitable for receiving..., Cl C-III 4.13) but it is essential for the definition of the invention that the transceiver circuit is designed to **receive(s)** the data from the data source via the first infrastructure wireless network when is out of the ad hoc wireless network range.

A copy of the relevant documents is enclosed

The title of the invention in the three official languages of the European Patent Office, the international patent classification, the designated Contracting States, the registered name of the applicant and the bibliographic data are shown on the attached EPO Form 2056.

You are requested within a non-extendable period of **four months** of notification of this communication

1. to file 1 set of translations of the claim(s) in the two other EPO official languages;

		EUR
2. to pay the fee for grant and publishing;	Reference 007	830.00
3. to pay the additional claims fee(s) (Rule 71(6) EPC) number of claims fees payable: 0	Reference 016	0.00
	Total amount	830.00

The mention of the grant of the patent shall be published in the European Patent Bulletin as soon as possible after the requirements concerning the translation of the claims and the payment of the fees for grant and publishing, claims fees, designation fee and renewal fees as laid down in Rule 71(3), (4), (6) and (8) and (9) EPC are fulfilled.

If you do not approve the text intended for grant but wish to request amendments or corrections, the procedure described in Rule 71(4) EPC is to be followed.

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

If this communication is based upon an auxiliary request, and you reply within the time limit set that you maintain the main or a higher ranking request which is not allowable, the application will be refused (Art. 97(2) EPC).

If the enclosed claims contain amendments proposed by the Examining Division, and you reply within the time limit set that you cannot accept these amendments, refusal of the application under Article 97(2) EPC will result if agreement cannot be reached on the text for grant.

In all cases except those of the previous two paragraphs, if the fees for grant and publishing or claims fees are not paid, or the translations are not filed, in due time, the European patent application will be deemed to be withdrawn (R. 71(7) EPC).

For all payments you are requested to use EPO Form 1010 or EPO Form 1010E or to refer to the relevant reference number.

After publication, the European patent specification can be downloaded free of charge from the EPO publication server https://data.epo.org/publication-server/ or ordered from the Vienna sub-office upon payment of a fee (OJ EPO 2005, 126).

Upon request in writing each proprietor will receive the certificate for the European patent **together with one copy** of the patent specification provided that the request is filed within the time limit of Rule 71(3) EPC. If such request has been previously filed, it has to be confirmed within the time limit of Rule 71(3) EPC. The requested copy is free of charge. If the request is filed after expiry of the Rule 71(3) EPC time limit, the certificate will be delivered without a copy of the patent specification (R.74 EPC, Decision of the President of the EPO, Special edition No.3, OJ EPO 2007, D.2).

Filing of a divisional application

Any divisional application relating to this European patent application must be filed directly with the European Patent Office in Munich, The Hague or Berlin and shall be in the language of the proceedings relating to the present application (cf. Article 76(1) and Rule 36(2) EPC). Any such divisional application must be filed while the present application is still pending and the time limit for filing divisional applications must be observed (Rule 36(1) EPC; Guidelines for Examination in the EPO, A-IV, 1.1.1).

Note on payment of renewal fees

If a renewal fee falls due between notification of the present communication and the proposed date of publication of the mention of the grant of the European patent, publication will be effected only after the renewal fee and any additional fee have been paid (R. 71(9) EPC).

Under Article 86(2) EPC, the obligation to pay renewal fees to the European Patent Office terminates with the payment of the renewal fee due in respect of the year in which the mention of the grant of the European patent is published.

Filing of translations in the Contracting States

As regards translation requirements prescribed by the Contracting States under Article 65(1) EPC, please consult the website of the European Patent Office
www.epo.org ➞Patents ➞Law ➞Legal texts ➞National law relating to the EPC
www.epo.org ➞Patents ➞Law ➞Legal texts ➞London Agreement

In case of a valid extension

As regards translation requirements prescribed by the Extension States, please consult the website of the European Patent Office
www.epo.org ➞Patents ➞Law ➞Legal texts ➞National law relating to the EPC

Failure to supply a prescribed translation in a Contracting State or an Extension State may result in the patent being deemed to be void *ab initio* in the State concerned (Article 65(3) EPC).

Important note to users of the automatic debiting procedure

The fees for grant and publishing and also any additional claims fees due under Rule 71(6) EPC will be debited automatically on the date of filing of the translation of the (relevant) claims, or on the last day of the period of this communication. However, if the designation fee becomes due as set out in Rule 71(8) EPC and/ or a renewal fee becomes due as set out in Rule 71(9) EPC, these should be paid separately by another permitted means of payment in order not to delay the publication of the mention of grant. The same applies in these circumstances to the payment of extension fees. For further details see the Arrangements for the automatic debiting procedure (AAD) and accompanying Information from the EPO concerning the automatic debiting procedure (Annexes A.1 and A.2 to the Arrangements for deposit accounts (ADA) in Supplement to OJ EPO 3/2009).

Examining Division:

Chairman:	Righetti, Marco
2nd Examiner:	Borowski, Michael
1st Examiner:	Moscu, Viorel

Peter, Nicole
For the Examining Division
Tel. No.: +49 89 2399 - 4252

Enclosure(s): Form 2056
42 Copies of the relevant documents

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY
Tel: +49 89 2399 0
Fax: +49 89 2399 4465

Application No.: 09 731 146.8

IV.2. Patent classification

The classification indicated on the published patent application remains unchanged. It is as follows:

INV. H04R1/02

IV.3. Title of the invention

The title indicated on the published patent application remains unchanged. It reads as follows:

DRAHTLOSER KOPFHÖRER MIT ÜBERGANG ZWISCHEN DRAHTLOSEN NETZWERKEN

WIRELESS EARPHONE THAT TRANSITIONS BETWEEN WIRELESS NETWORKS

ÉCOUTEUR SANS FIL QUI EFFECTUE DES TRANSITIONS ENTRE DES RÉSEAUX SANS FIL

IV.4. Documentation

16/01/2012
Date

Righetti, Marco
Chairman

Moscu, Viorel
1st examiner

Borowski, Michael
2nd examiner

Enclosure(s):

~~WIRELESS EARPHONE THAT TRANSITIONS BETWEEN WIRELESS NETWORKS~~

Inventors: Michael J. Pelland, Michael J. Koss, Michael Sagan, Steven Reckamp, Greg Hollingstad, Jeff Bovee, and Morgan Lowery

PRIORITY CLAIM

The present application claims priority to United States provisional application serial number 61/123,265, filed April 7, 2008~~, which is incorporated herein by reference~~.

BACKGROUND

Digital audio players, such as MP3 players and iPods, that store and play digital audio files, are very popular. Such devices typically comprise a data storage unit for storing and playing the digital audio, and a headphone set that connects to the data storage unit, usually with a 1/4" or a 3.5 mm jack and associated cord. Often the headphones are in-ear type headphones. The cord, however, between the headphones and the data storage unit can be cumbersome and annoying to users, and the length of the cord limits the physical distance between the data storage unit and the headphones. Accordingly, some cordless headphones have been proposed, such as the Monster iFreePlay cordless headphones from Apple Inc., which include a docking port on one of the earphones that can connect directly to an iPod Shuffle. Because they have the docking port, however, the Monster iFreePlay cordless headphones from Apple are quite large and are not in- ear type phones. Recently, cordless headphones that connect wirelessly via IEEE 802.11 to a WLAN-ready laptop or personal computer (PC) have been proposed, but such headphones are also quite large and not in-ear type phones.

US2007/0165875A1 discloses a multiple-antennae wireless multimedia headset having peer-to-peer networking capability and which is configured for convenient hand off between multiple wireless interfaces.

According to a first aspect of the present invention, there is provided an earphone as defined in claim 1.

According to a second aspect of the present invention, there is provided a method as defined in claim 19

When the data source and the earphone are out of range via the ad hoc wireless network, they may transition automatically to a common infrastructure wireless network (e.g., a wireless LAN). If there is no common infrastructure wireless network for both the data source and the earphone, the earphone may connect via an available infrastructure wireless network to a host server. The host server may, for example, broadcast streaming audio to the earphone and/or transmit to the earphone a network address (e.g., an Internet Protocol (IP) address) for a network-connected content server that

→ page 2

streams digital audio. The earphone may then connect to the content server using the IP address. The content server may be an Internet radio server, including, for example, an Internet radio server that broadcasts streaming audio from the data source or some other content.

These and other advantageous, unique aspects of the wireless earphone are described below.

FIGURES

Various embodiments of the present invention are described herein by way of example in conjunction with the following figures, wherein:

Figures 1A-1E are views of a wireless earphone according to various embodiments of the present invention;

Figures 2A-2D illustrate various communication modes for a wireless earphone according to various embodiments of the present invention;

Figure 3 is a block diagram of a wireless earphone according to various embodiments of the present invention;

Figures 4A-4B show the wireless earphone connected to another device according to various embodiments of the present invention;

Figure 5 is a diagram of a process implemented by a host server according to various embodiments of the present invention;

Figure 6 is a diagram of a process implemented by the wireless earphone to transition automatically between wireless networks according to various embodiments of the present invention;

Figures 7, 8 and 10 illustrate communication systems involving the wireless earphone according to various embodiments of the present invention;

Figure 9 is a diagram of a headset including a wireless earphone and a microphone according to various embodiments of the present invention; and

Figure 11 is a diagram of a pair of wireless earphones with a dongle according to various embodiments of the present invention.

DESCRIPTION

In one general aspect, the present invention is directed to a wireless earphone that receives streaming audio data via ad hoc wireless networks and infrastructure wireless networks, and that transitions seamlessly between wireless networks. The earphone may comprise one or more in-ear, on-ear, or over-ear speaker elements. Two exemplary in-ear earphone shapes for the wireless earphone 10 are shown in Figures 1A and 1B, respectively, although in other embodiments the

earphone may take different shapes and the exemplary shapes shown in Figures 1A and 1B are not intended to be limiting. In one embodiment, the earphone transitions automatically and seamlessly, without user intervention, between communication modes. That is, the earphone may transition automatically from an ad hoc wireless network to an infrastructure wireless network, without user intervention. As used herein, an "ad hoc wireless network" is a network where two (or more) wireless-capable devices, such as the earphone and a data source, communicate directly and wirelessly, without using an access point. An "infrastructure wireless network," on the other hand, is a wireless network that uses one or more access points to allow a wireless-capable device, such as the wireless earphone, to connect to a computer network, such as a LAN or WAN (including the Internet).

Figures 1A and 1B show example configurations for a wireless earphone 10 according to various embodiments of the present invention. The examples shown in Figures 1A and 1B are not limiting and other configurations are within the scope of the present invention. As shown in Figures 1A and 1B, the earphone 10 may comprise a body 12. The body 12 may comprise an ear canal portion 14 that is inserted in the ear canal of the user of the earphone 10. In various embodiments, the body 12 also may comprise an exterior portion 15 that is not inserted into user's ear canal. The exterior portion 15 may comprise a knob 16 or some other user control (such as a dial, a pressure-activated switch, lever, etc.) for adjusting the shape of the ear canal portion 14. That is, in various embodiments, activation (e.g. rotation) of the knob 16 may cause the ear canal portion 14 to change shape so as to, for example, radially expand to fit snugly against all sides of the user's ear canal. Further details regarding such a shape-changing earbud earphone are described in application PCT/US08/88656, filed 31 December 2008, entitled "Adjustable Shape Earphone," ~~which is incorporated herein by reference in its entirety~~. The earphone 10 also may comprise a transceiver circuit housed within the body 12. The transceiver circuit, described further below, may transmit and receive the wireless signals, including receive streaming audio for playing by the earphone 10. The transceiver circuit may be housed in the exterior portion 15 of the earphone 10 and/or in the ear canal portion 14.

Although the example earphones 10 shown in Figures 1A and 1B include a knob 16 for adjusting the shape of the ear canal portion 14, the present invention is not so limited, and in other embodiments, different means besides a knob 16 may be used to adjust the ear canal portion 14. In addition, in other embodiments, the earphone 10 may not comprise a shape-changing ear canal portion 14.

In various embodiments, the user may wear two discrete wireless earphones 10: one in each ear. In such embodiments, each earphone 10 may comprise a transceiver circuit. In such

embodiments, the earphones 10 may be connected by a string or some other cord-type connector to keep the earphones 10 from being separated.

In other embodiments, as shown in Figure 1C, a headband 19 may connect the two (left and right) earphones 10. The headband 19 may be an over-the-head band, as shown in the example of Figure 1C, or the headband may be a behind-the-head band. In embodiments comprising a headband 19, each earphone 10 may comprise a transceiver circuit; hence, each earphone 10 may receive and transmit separately the wireless communication signals. In other embodiments comprising a headband 19, only one earphone 10 may comprise the transceiver circuit, and a wire may run along the headband 19 to the other earphone 10 to connect thereby the transceiver circuit to the acoustic transducer in the earphone that does not comprise the transceiver circuit. The embodiment shown in Figure 1C comprises on-ear earphones 10; in other embodiments, in-ear or over-ear earphones may be used.

In other embodiments, the earphone 10 may comprise a hanger bar 17 that allows the earphone 10 to clip to, or hang on, the user's ear, as shown in the illustrated embodiment of Figures 1D-1E. Figure 1D is a perspective view of the earphone and Figure 1E is a side view according to one embodiment. As shown in the illustrated embodiment, the earphone 10 may comprise dual speaker elements 106-A, 106-B. One of the speaker elements (the smaller one) 106-A is sized to fit into the cavum concha of the listener's ear and the other element (the larger one) 106-B is not. The listener may use the hanger bar to position the earphone on the listener's ear. In that connection, the hanger bar may comprise a horizontal section that rests upon the upper external curvature of the listener's ear behind the upper portion of the auricula (or pinna). The earphone may comprise a knurled knob that allows the user to adjust finely the distance between the horizontal section of the hanger bar and the speaker elements, thereby providing, in such embodiments, another measure of adjustability for the user. More details regarding such a dual element, adjustable earphone may be found in United States provisional patent application Serial No. 61/054,238~~(which is incorporated herein by reference in its entirety)~~.

Figures 2A-2D illustrate various communication modes for a wireless data communication system involving the earphone 10 according to embodiments of the present invention. As shown in Figure 2A, the system comprises a data source 20 in communication with the earphone 10 via an ad hoc wireless network 24. The earphone 10, via its transceiver circuit (described in more detail below), may communicate wirelessly with a data source 20, which may comprise a wireless network adapter 22 for transmitting the digital audio wirelessly. For example, the data source 20 may be a digital audio player (DAP), such as an mp3 player or an iPod, or any other suitable digital audio playing device, such as a laptop or personal computer, that stores and/or plays digital

audio files. In other embodiments, the data source 20 may generate analog audio, and the wireless network adapter 22 may encode the analog audio into digital format for transmission to the earphone 10.

The wireless network adapter 22 may be an integral part of the data source 20, or it may be a separate device that is connected to the data source 20 to provide wireless connectivity for the data source 20. For example, the wireless network adapter 22 may comprise a wireless network interface card (WNIC) or other suitable transceiver that plugs into a USB port or other port or jack of the data source 20 (such as a TRS connector) to stream data, e.g., digital audio files, via a wireless network (e.g., the ad hoc wireless network 24 or an infrastructure wireless network). The digital audio transmitted from the data source 20 to the earphone 10 via the wireless networks may comprise compressed or uncompressed audio. Any suitable file format may be used for the audio, including mp3, lossy or lossless WMA, Vorbis, Musepack, FLAC, WAV, AIFF, AU, or any other suitable file format.

When in range, the data source 20 may communicate with the earphone 10 via the ad hoc wireless network 24 using any suitable wireless communication protocol, including Wi-Fi (e.g., IEEE 802.11a/b/g/n), WiMAX (IEEE 802.16), Bluetooth, Zigbee, UWB, or any other suitable wireless communication protocol. For purposes of the description to follow, it is assumed that the data source 20 and the earphone 10 communicate using a Wi-Fi protocol, although the invention is not so limited and other wireless communication protocols may be used in other embodiments of the invention. The data source 20 and the earphone 10 are considered in range for the ad hoc wireless network 24 when the signal strengths (e.g., the RSSI) of the signals received by the two devices are above a threshold minimum signal strength level. For example, the data source 20 and the earphone 10 are likely to be in range for an ad hoc wireless network when then are in close proximity, such as when the wearer of the earphone 10 has the data source 20 on his/her person, such as in a pocket, strapped to their waist or arm, or holding the data source in their hand.

When the earphone 10 and the data source 20 are out of range for the ad hoc wireless network 24, that is, when the received signals degrade below the threshold minimum signal strength level, both the earphone 10 and the data source 20 may transition automatically to communicate over an infrastructure wireless network (such as a wireless LAN (WLAN)) 30 that is in the range of both the earphone 10 and the data source 20, as shown in Figure 2B. The earphone 10 and the data source 20 (e.g., the wireless network adapter 22) may include firmware, as described further below, that cause the components to make the transition to a common infrastructure wireless network 30 automatically and seamlessly, e.g., without user intervention. The earphone 10 may cache the received audio in a buffer or memory for a time period before

playing the audio. The cached audio may be played after the connection over the ad hoc wireless network is lost to give the earphone 10 and the data source 20 time to connect via the infrastructure wireless network.

For example, as shown in Figure 2B, the infrastructure network may comprise an access point 32 that is in the range of both the data source 20 and the earphone 10. The access point 32 may be an electronic hardware device that acts as a wireless access point for, and that is connected to, a wired and/or wireless data communication network 33, such as a LAN or WAN, for example. The data source 20 and the earphone 10 may both communicate wirelessly with the access point 32 using the appropriate network data protocol (a Wi-Fi protocol, for example). The data source 20 and the earphone 10 may both transition automatically to an agreed-upon WLAN 30 that is in the range of both devices when they cannot communicate satisfactorily via the ad hoc wireless network 24. A procedure for specifying an agreed-upon infrastructure wireless network 30 is described further below. Alternatively, the infrastructure wireless network 30 may have multiple access points 32a-b, as shown in Figure 2C. In such an embodiment, the data source 20 may communicate wirelessly with one access point 32b and the earphone 10 may communicate wirelessly with another access point 32a of the same infrastructure wireless network 30. Again, the data source 20 and the earphone 10 may transition to an agreed-upon WLAN.

If there is no suitable common infrastructure wireless network over which the earphone 10 and the data source 20 can communicate, as shown in Fig. 2D, the earphone 10 may transition to communicate with an access point 32a for an available (first) wireless network (e.g., WLAN) 30a that is in the range of the earphone 10. In this mode, the earphone 10 may connect via the wireless network 30a to a network-enabled host server 40. The host server 40 may be connected to the wireless network 30a via an electronic data communication network 42, such as the Internet. In one mode, the host server 40 may transmit streaming digital audio via the networks 33a, 42 to the earphone 10. In another mode, the host server 40 may transmit to the earphone 10 a network address, such as an Internet Protocol (IP) address, for a streaming digital audio content server 70 on the network 42. Using the received IP address, the earphone 10 may connect to the streaming digital audio content server 70 via the networks 30a, 42 to receive and process digital audio from the streaming digital audio content server 70.

The digital audio content server 70 may be, for example, an Internet radio station server. The digital audio content server 70 may stream digital audio over the network 42 (e.g., the Internet), which the earphone 10 may receive and process. In one embodiment, the streaming digital audio content server 70 may stream digital audio received by the streaming digital audio content server 70 from the data source 20. For example, where the data source 20 is a wireless-

capable device, such as a portable DAP, the data source 20 may connect to the streaming digital audio content server 70 via a wireless network 30b and the network 42. Alternatively, where for example the data source 20 is non-wireless-capable device, such as a PC, the data source 20 may have a direct wired connection to the network 42. After being authenticated by the streaming digital audio content server 70, the data source 20 may stream digital audio to the streaming digital audio content server 70, which may broadcast the received digital audio over the network 42 (e.g., the Internet). In such a manner, the user of the earphone 10 may listen to audio from the data source 20 even when (i) the earphone 10 and the data source 20 are not in communication via an ad hoc wireless network 24 and (ii) the earphone 10 and the data source 20 are not in communication via a common local infrastructure wireless network 30.

Figure 3 is a block diagram of the earphone 10 according to various embodiments of the present invention. In the illustrated embodiment, the earphone 10 comprises a transceiver circuit 100 and related peripheral components. As shown in Figure 3, the peripheral components of the earphone 10 may comprise a power source 102, a microphone 104, one or more acoustic transducers 106 (e.g., speakers), and an antenna 108. The transceiver circuit 100 and some of the peripheral components (such as the power source 102 and the acoustic transducers 106) may be housed within the body 12 of the earphone 10 (see Figure 1). Other peripheral components, such as the microphone 104 and the antenna 108 may be external to the body 12 of the earphone 10. In addition, some of the peripheral components, such as the microphone 104, are optional in various embodiments.

In various embodiments, the transceiver circuit 100 may be implemented as a single integrated circuit (IC), such as a system-on-chip (SoC), which is conducive to miniaturizing the components of the earphone 10, which is advantageous if the earphone 10 is to be relatively small in size, such as an in-ear earphone (see Figures 1A-1B for example). In alternative embodiments, however, the components of the transceiver circuit 100 could be realized with two or more discrete ICs or other components, such as separate ICs for the processors, memory, and RF (e.g., Wi-Fi) module, for example.

The power source 102 may comprise, for example, a rechargeable or non-rechargeable battery (or batteries). In other embodiments, the power source 102 may comprise one or more ultracapacitors (sometimes referred to as supercapacitors) that are charged by a primary power source. In embodiments where the power source 102 comprises a rechargeable battery cell or an ultracapacitor, the battery cell or ultracapacitor, as the case may be, may be charged for use, for example, when the earphone 10 is connected to a docking station or computer. The docking station may be connected to or part of a computer device, such as a laptop computer or PC. In

addition to charging the rechargeable power source 102, the docking station and/or computer may facilitate downloading of data to and/or from the earphone 10. In other embodiments, the power source 102 may comprise capacitors passively charged with RF radiation, such as described in U.S. Patent No. 7,027,311. The power source 102 may be coupled to a power source control module 103 of transceiver circuit 100 that controls and monitors the power source 102.

The acoustic transducer(s) 106 may be the speaker element(s) for conveying the sound to the user of the earphone 10. According to various embodiments, the earphone 10 may comprise one or more acoustic transducers 106. For embodiments having more than one transducer, one transducer may be larger than the other transducer, and a crossover circuit (not shown) may transmit the higher frequencies to the smaller transducer and may transmit the lower frequencies to the larger transducer. More details regarding dual element earphones are provided in U.S. Patent 5,333,206, assigned to Koss Corporation, which is incorporated herein by reference in its entirety.

The antenna 108 may receive and transmit the wireless signals from and to the wireless networks 24, 30. A RF (e.g., Wi-Fi) module 110 of the transceiver circuit 100 in communication with the antenna 108 may, among other things, modulate and demodulate the signals transmitted from and received by the antenna 108. The RF module 110 communicates with a baseband processor 112, which performs other functions necessary for the earphone 10 to communicate using the Wi-Fi (or other communication) protocol.

The baseband processor 112 may be in communication with a processor unit 114, which may comprise a microprocessor 116 and a digital signal processor (DSP) 118. The microprocessor 116 may control the various components of the transceiver circuit 100. The DSP 114 may, for example, perform various sound quality enhancements to the digital audio received by the baseband processor 112, including noise cancellation and sound equalization. The processor unit 114 may be in communication with a volatile memory unit 120 and a non-volatile memory unit 122. A memory management unit 124 may control the processor unit's access to the memory units 120, 122. The volatile memory 122 may comprise, for example, a random access memory (RAM) circuit. The non-volatile memory unit 122 may comprise a read only memory (ROM) and/or flash memory circuits. The memory units 120, 122 may store firmware that is executed by the processor unit 114. Execution of the firmware by the processor unit 114 may provide various functionality for the earphone 10, such as the automatic transition between wireless networks as described herein. The memory units 120, 122 may also cache received digital audio.

A digital-to-analog converter (DAC) 125 may convert the digital audio from the processor unit 114 to analog form for coupling to the acoustic transducer(s) 106. An I^2S interface 126 or other suitable serial or parallel bus interface may provide the interface between the processor unit 114 and the DAC 125. An analog-to-digital converter (ADC) 128, which also communicates with the I^2S interface 126, may convert analog audio signals picked up by the microphone 104 for processing by the processor unit 114.

The transceiver circuit 100 also may comprise a USB or other suitable interface 130 that allows the earphone 10 to be connected to an external device via a USB cable or other suitable link. As shown in Figure 4A, the external device may be a docking station 200 connected to a computer device 202. Also, in various embodiments, the earphone 10 could be connected directly to the computer 202 without the docking station 200. In addition, the external device may be a DAP 210, as shown in Figure 4B. In that way, the earphone 10 could connect directly to a data source 20, such as the DAP 210 or the computer 202, through the USB port 130. In addition, through the USB port 130, the earphone 10 may connect to a PC 202 or docking station 202 to charge up the power source 102 and/or to get downloads (e.g., data or firmware).

According to various embodiments, the earphone 10 may have an associated web page that a user may access through the host server 40 (see Figure 2D) or some other server. An authenticated user could log onto the website from a client computing device 50 (e.g., laptop, PC, handheld computer device, etc., including the data source 20) (see Figure 2D) to access the web page for the earphone 10 to set various profile values for the earphone 10. For example, at the web site, the user could set various content features and filters, as well as adjust various sound control features, such as treble, bass, frequency settings, noise cancellation settings, etc. In addition, the user could set preferred streaming audio stations, such as preferred Internet radio stations or other streaming audio broadcasts. That way, instead of listening to streaming audio from the data source 20, the user could listen to Internet radio stations or other streaming audio broadcasts received by the earphone 10. In such an operating mode, the earphone user, via the web site, may prioritize a number of Internet radio stations or other broadcast sources (hosted by streaming digital audio content servers 70). With reference to Figure 7, the host server 40 may send the IP address for the earphone user's desired (e.g., highest priority) Internet radio station to the earphone 10. A button 11 on the earphone 10, such as on the rotating dial 16 as shown in the examples of Figures 1A and 1B, may allow the user to cycle through the preset preferred Internet radio stations. That is, for example, when the user presses the button 11, an electronic communication may be transmitted to the host server 40 via the wireless network 30, and in response to receiving the communication, the host server 40 may send the IP address for the

user's next highest rated Internet radio station via the network 42 to the earphone 10. The earphone 10 may then connect to the streaming digital audio content server 70 for that Internet radio station using the IP address provided by the host server 40. This process may be repeated, e.g., cycled through, for each preset Internet radio station configured by the user of the earphone 10.

At the web site for the earphone 10 hosted on the host server 40, in addition to establishing the identification of digital audio sources (e.g., IDs for the user's DAP or PC) and earphones, the user could set parental or other user controls. For example, the user could restrict certain Internet radio broadcasts based on content or parental ratings, etc. That is, for example, the user could configure a setting through the web site that prevents the host server 40 from sending an IP address for a streaming digital audio content server 70 that broadcasts explicit content based on a rating for the content. In addition, if a number of different earphones 10 are registered to the same user, the user could define separate controls for the different earphones 10 (as well as customize any other preferences or settings particular to the earphones 10, including Internet radio stations, sound quality settings, etc. that would later be downloaded to the earphones 10). In addition, in modes where the host server 40 streams audio to the earphone 10, the host server 40 may log the files or content streamed to the various earphones 10, and the user could view at the web site the files or content that were played by the earphones 10. In that way, the user could monitor the files played by the earphones 10.

In addition, the host server 40 may provide a so-called eavesdropping function according to various embodiments. The eavesdropping service could be activated via the web site. When the service is activated, the host server 40 may transmit the content that it is delivering to a first earphone 10a to another, second earphone 10b, as shown in Figure 8. Alternatively, the host server 40 may transmit to the second earphone 10b the most recent IP address for a streaming digital audio content server 70 that was sent to the first earphone 10a. The second earphone 10b may then connect to the streaming digital audio content server 70 that the first earphone 10a is currently connected. That way, the user of the second earphone 10b, which may be a parent, for example, may directly monitor the content being received by the first earphone 10a, which may belong to a child of the parent.

This function also could be present in the earphones 10 themselves, allowing a parent (or other user) to join an ad-hoc wireless network and listen to what their child (or other listener) is hearing. For example, with reference to Figure 10, a first earphone 10a may receive wireless audio, such as from the data source 20 or some other source, such as the host server 40. The first earphone 10a may be programmed with firmware to broadcast the received audio to a second

earphone 10b via an ad hoc wireless network 24. That way, the wearer of the second earphone 10b can monitor in real-time the content being played by the first earphone 10a.

At the web site, the user may also specify the identification number ("ID") of their earphone(s) 10, and the host server 40 may translate the ID to the current internet protocol (IP) addresses for the earphone 10 and for the data source 20. This allows the user to find his or her data source 20 even when it is behind a firewall or on a changing IP address. That way, the host server 40 can match the audio from the data source 20 to the appropriate earphone 10 based on the specified device ID. The user also could specify a number of different data sources 20. For example, the user's DAP may have one specified IP address and the user's home (or work) computer may have another specified IP address. Via the web site hosted by the host server 40, the user could specify or prioritize from which source (e.g., the user's DAP or computer) the earphone 10 is to receive content.

The host server 40 (or some other server) may also push firmware upgrades and/or data updates to the earphone 10 using the IP addresses of the earphone 10 via the networks 30, 42. In addition, a user could download the firmware upgrades and/or data updates from the host server 40 to the client computing device 202 (see Figure 4A) via the Internet, and then download the firmware upgrades and/or data updates to the earphone 10 when the earphone 10 is connected to the client computer device 202 (such as through a USB port and/or the docking station 200).

Whether the downloads are transmitted wirelessly to the earphone 10 or via the client computing device 202 may depend on the current data rate of the earphone 10 and the quantity of data to be transmitted to the earphone 10. For example, according to various embodiments, as shown in the process flow of Figure 5, the host server 40 may be programmed, at step 50, to make a determination, based on the current data rate for the earphone 10 and the size of the update, whether the update should be pushed to the earphone 10 wirelessly (e.g., via the WLAN 30a in Figure 2D). If the update is too large and/or the current data rate is too low that the performance of the earphone 10 will be adversely affected, the host server 40 may refrain from pushing the update to the earphone 10 wirelessly and wait instead to download the update to the client computing device 202 at step 51. Conversely, if the host server 40 determines that, given the size of the update and the current data rate for the earphone 10 that the performance of the earphone 10 will not be adversely affected, the host server 40 may transmit the update wirelessly to the earphone 10 at step 52.

As mentioned above, the processor unit 114 of the speakerphones 14 may be programmed, via firmware stored in the memory 120, 122, to have the ability to transition automatically from the ad hoc wireless network 24 to an infrastructure wireless network 30 (such as a WLAN) when

the quality of the signal on the ad hoc wireless network 24 degrades below a suitable threshold (such as when the data source 20 is out of range for an ad hoc wireless network). In that case, the earphone 10 and the data source 20 may connect to a common infrastructure wireless network (e.g., WLAN) (see, for example, Figures 2B-2C). Through the web site for the earphone 10, described above, the user could specify a priority of infrastructure wireless networks 30 for the data source 20 and the earphone 10 to connect to when the ad hoc wireless network 24 is not available. For example, the user could specify a WLAN servicing his/her residence first, a WLAN servicing his/her place of employment second, etc. During the time that the earphone 10 and the data source 20 are connected via the ad hoc wireless network 24, the earphone 10 and the data source 20 may exchange data regarding which infrastructure networks are in range. When the earphone 10 and the data source 20 are no longer in range for the ad hoc wireless network 24 (that is, for example, the signals between the device degrade below an acceptable level), they may both transition automatically to the highest prioritized infrastructure wireless network whose signal strength is above a certain threshold level. That way, even though the earphone 10 and the data source 20 are out of range for the ad hoc wireless network 24, the earphone 10 may still receive the streaming audio from the data source 20 via the infrastructure wireless network 30 (see Figs. 2B-2C).

When none of the preferred infrastructure networks is in range, the earphone 10 may connect automatically to the host server 40 via an available infrastructure wireless network 30 (see Fig. 2D), e.g., the infrastructure wireless network 30 having the highest RSSI and to which the earphone 10 is authenticated to use. The host server 40, as mentioned above, may transmit IP addresses to the earphone 10 for streaming digital audio content servers 70 or the host sever 40 may stream digital audio to the earphone 10 itself when in this communication mode.

Figure 6 is a diagram of the process flow, according to one embodiment, implemented by the transceiver circuit 100 of the earphone 10. The process shown in Figure 6 may be implemented in part by the processor unit 114 executing firmware stored in a memory unit 120, 122 of the transceiver circuit 100. At step 61, the earphone 10 may determine if it can communicate with the data source 20 via an ad hoc wireless network 24. That is, the earphone 10 may determine if the strength of the wireless signals from the data source 20 exceed some minimum threshold. If so, the data source 20 and the earphone 10 may communicate wirelessly via the ad hoc wireless network 24 (see Figure 2A). While in this communication mode, at step 62, the data source 20 and the earphone 10 also may exchange data regarding the local infrastructure wireless networks, if any, in the range of the data source 20 and the earphone 10, respectively. For example, the earphone 10 may transmit the ID of local infrastructure wireless

networks 30 that the earphone 10 can detect whose signal strength (e.g., RSSI) exceeds some minimum threshold level. Similarly, the data source 20 may transmit the ID the local infrastructure wireless networks 30 that the data source 20 can detect whose signal strength (e.g., RSSI) exceeds some minimum threshold level. The earphone 10 may save this data in a memory unit 120, 122. Similarly, the data source 20 may store in memory the wireless networks that the earphone 10 is detected.

The data source 20 and the earphone 10 may continue to communicate via the ad hoc wireless network mode 24 until they are out of range (e.g., the signal strengths degrade below a minimum threshold level). If an ad hoc wireless network 24 is not available at block 61, the transceiver circuit 100 and the data source 20 may execute a process, shown at block 63, to connect to the user's highest prioritized infrastructure wireless network 30. For example, of the infrastructure wireless networks whose signal strength exceeded the minimum threshold for both the earphone 10 and the data source 20 determined at step 62, the earphone 10 and the data source 20 may both transition to the infrastructure wireless network 30 having the highest priority, as previously set by the user (seen Figures 2B-2C, for example). For example, if the user's highest prioritized infrastructure wireless network 30 is not available, but the user's second highest prioritized infrastructure wireless network 30 is, the earphone 10 and the data source 20 may both transition automatically to the user's second highest prioritized infrastructure wireless network 30 at block 64. As shown by the loop with block 65, the earphone 10 and the data source 20 may continue to communicate via one of the user's prioritized infrastructure wireless networks 30 as long as the infrastructure wireless network 30 is available. If the infrastructure wireless network becomes unavailable, the process may return to block 61.

If, however, no ad hoc wireless network and none of the user's prioritized infrastructure wireless networks are available, the earphone 10 may transition automatically to connect to the host server 40 at block 66 (see Figure 2D) using an available infrastructure wireless network 30. At block 67, the host server 40 may transmit an IP address to the earphone 10 for one of the streaming digital audio content servers 70, and at block 68 the earphone 10 may connect to the streaming digital audio content server 70 using the received IP address. At step 69, as long as the earphone 10 is connected to the streaming digital audio content server 70, the earphone 10 may continue to communicate in this mode. However, if the earphone 10 loses its connection to the digital audio content server 70, the process may return to block 61 in one embodiment. As mentioned above, at block 67, instead of sending an IP address for a streaming digital audio content server 70, the host server 40 may stream digital audio to the earphone 10. The user, when configuring their earphone 10 preferences via the web site, may specify and/or prioritize whether

the host server 40 is to send IP addresses for the streaming digital audio content servers 70 and/or whether the host server 40 is to stream audio to the earphone 10 itself.

In another embodiment, the earphone 10 may be programmed to transition automatically to the host server 40 when the earphone 10 and the data source 20 are not in communication via the ad hoc wireless network 24. That is, in such an embodiment, the earphone 10 may not try to connect via a local infrastructure wireless network 30 with the data source 20, but instead transition automatically to connect to the host server 40 (see Figure 2D).

In various embodiments, as shown in Figure 1B, the button 11 or other user selection device that allows the wearer of the earphone 10 to indicate approval and/or disapproval of songs or other audio files listened to by the wearer over an Internet radio station. The approval/disapproval rating, along with metadata for the song received by the earphone 10 with the streaming audio, may be transmitted from the transceiver circuit 100 of the earphone 10 back to the host server 40, which may log the songs played as well as the ratings for the various songs/audio files. In addition to being able to view the logs at the website, the host server 40 (or some other server) may send an email or other electronic communication to the earphone user, at a user specified email address or other address, which the user might access from their client communication device 50 (see Figure 2D). The email or other electronic communication may contain a listing of the song/audio files for which the user gave approval ratings using the button 11 or other user selection device. Further, the email or other electronic communication may provide a URL link for a URL at which the user could download song/audio files that the user rated (presumably song/audio files for which the user gave an approval rating). In some instances, the user may be required to pay a fee to download the song/audio file.

The user song ratings also may be used by the host server 40 to determine the user's musical preferences and offer new music that the user might enjoy. More details about generating user play lists based on song ratings may be found in published U.S. patent applications Pub. No. 2006/0212444, Pub. No. 2006/0206487, and Pub. No. 2006/0212442, and U.S. Patent 7,003,515, which are incorporated herein by reference in their entirety.

In addition or alternatively, the user could log onto a web site hosted by the host server 40 (or some other server) to view the approval/disapproval ratings that the user made via the button 11 on the earphone 10. The web site may provide the user with the option of downloading the rated songs/audio files (for the host server 40 or some other server system) to their client computer device 50. The user could then have their earphone 10 connect to their client computer device 50 as a data source 20 via an ad hoc wireless network 24 (see Figure 2A) or via an infrastructure wireless network (see Figures 2B-2D) to listen to the downloaded songs. In

addition, the user could download the song files from their client computer device 50 to their DAP and listen to the downloaded song files from their DAP by using their DAP as the data source 20 in a similar manner.

Another application of the headsets may be in vehicles equipped with Wi-Fi or other wireless network connectivity. Published PCT application WO 2007/136620, which is incorporated herein by reference, discloses a wireless router for providing a Wi-Fi or other local wireless network for a vehicle, such as a car, truck, boat, bus, etc. In a vehicle having a Wi-Fi or other local wireless network, the audio for other media systems in the vehicle could be broadcast over the vehicle's wireless network. For example, if the vehicle comprises a DVD player, the audio from the DVD system could be transmitted to the router and broadcast over the vehicle's network. Similarly, the audio from terrestrial radio stations, a CD player, or an audio cassette player could be broadcast over the vehicle's local wireless network. The vehicle's passengers, equipped with the earphones 10, could cycle through the various audio broadcasts (including the broadcasts from the vehicle's media system as well as broadcasts from the host server 40, for example) using a selection button 11 on the earphone 10. The vehicle may also be equipped with a console or terminal, etc., through which a passenger could mute all of the broadcasts for direct voice communications, for example.

As described above, the earphones 10 may also include a microphone 104, as shown in the example of Figure 9. The headset 90 shown in Figure 9 includes two earphones 10, both of which may include a transceiver circuit 100 or only one of which may include the transceiver circuit, as discussed above. The microphone 104 could be used to broadcast communications from one earphone wearer to another earphone wearer. For example, one wearer could activate the microphone by pressing a button 92 on the headset 90. The headset 90 may then transmit a communication via an ad hoc wireless network 24 or other wireless network to a nearby recipient (or recipients) equipped with a headset 90 with a transceiver circuit 100 in one or both of the earphones 10. When such communication is detected by the recipient's headset 90, the streaming audio received over the wireless network by the recipient's headset 90 may be muted, and the intercom channel may be routed to the transducer(s) of the recipient's headset 90 for playing for the recipient. This functionality may be valuable and useful where multiple wearers of the headsets 90 are in close proximity, such as on motorcycles, for example.

Another exemplary use of the earphones 10 is in a factory, warehouse, construction site, or other environment that might be noisy. Persons (e.g., workers) in the environment could use the earphones 10 for protection from the surrounding noise of the environment. From a console or terminal, a person (e.g., a supervisor) could select a particular recipient for a communication over

the Wi-Fi network (or other local wireless network). The console or terminal may have buttons, dials, or switches, etc., for each user/recipient, or it could have one button or dial through which the sender could cycle through the possible recipients. In addition, the console or terminal could have a graphical user interface, through which the sender may select the desired recipient(s).

As mentioned above, the earphones 10 may comprise a USB port. In one embodiment, as shown in Figure 11, the user may use an adapter 150 that connects to the USB port of each earphone 10. The adapter 150 may also have a plug connector 152, such as a 3.5 mm jack, which allows the user to connect the adapter 150 to devices having a corresponding port for the connector 152. When the earphones 10 detect a connection via their USB interfaces in such a manner, the Wi-Fi (or other wireless protocol) components may shut down or go into sleep mode, and the earphones 10 will route standard headphone level analog signals to the transducer(s) 106. This may be convenient in environments where wireless communications are not permitted, such as airplanes, but where there is a convenient source of audio contact. For example, the adapter 150 could plug into a person's DAP. The DSP 118 of the earphone 10 may still be operational in such a non-wireless mode to provide noise cancellation and any applicable equalization.

The examples presented herein are intended to illustrate potential and specific implementations of the embodiments. It can be appreciated that the examples are intended primarily for purposes of illustration for those skilled in the art. No particular aspect of the examples is/are intended to limit the scope of the described embodiments.

According to various embodiments, therefore, the present invention is directed to an earphone 10 that comprises a body 12, where the body 12 comprises: (i) at least one acoustic transducer 106 for converting an electrical signal to sound; (ii) an antenna 108; and (iii) a transceiver circuit 100 in communication with the at least one acoustic transducer 106 and the antenna 108. The transceiver circuit 100 is for receiving and transmitting wireless signals via the antenna 108, and the transceiver circuit 100 is for outputting the electrical signal to the at least one acoustic transducer 106. The wireless transceiver circuit also comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to: (i) receive digital audio wirelessly from a data source 20 via an ad hoc wireless network 24 when the data source 20 is in wireless communication range with the earphone 10 via the ad hoc wireless network 24; and (ii) when the data source 20 is not in wireless communication range with the earphone 10 via the ad hoc wireless network 24, transition automatically to receive digital audio via an infrastructure wireless network 30.

According to various implementations, the data source may comprise a portable digital audio player, such as an MP3 player, iPod, or laptop computer, or a nonportable digital audio

player, such as a personal computer. In addition, the transceiver circuit 100 may comprise: (i) a wireless communication module 110 (such as a Wi-Fi or other wireless communication protocol module); (ii) a processor unit 114 in communication with the wireless communication module 110; (iii) a non-volatile memory unit 122 in communication with the processor unit 114; and (iv) a volatile memory 120 unit in communication with the processor unit 114. The infrastructure wireless network may comprise a WLAN. The transceiver circuit 100 may receive digital audio from the data source 20 via the infrastructure wireless network 30 when the data source 20 is not in wireless communication range with the earphone 10 via the ad hoc wireless network 24. The transceiver circuit firmware, when executed by the transceiver circuit 100, may cause the transceiver circuit 100 of the earphone 10 to transition automatically to a pre-set infrastructure wireless network 30 that the data source 20 transitions to when the data source 20 is not in wireless communication range with the earphone 10 via the ad hoc wireless network 24 and when the pre-set infrastructure wireless network 30 is in range of both the earphone 10 and the data source 20. In addition, the transceiver circuit firmware, when executed by the transceiver circuit 100, may cause the transceiver circuit 100 of the earphone 10 to transmit data via the ad hoc wireless network 24 to the data source 20 regarding one or more infrastructure wireless networks 30 detected by the transceiver circuit 100 when the earphone 10 and the data source 20 are communicating via the ad hoc wireless network 24.

In addition, the transceiver circuit firmware, when executed by the transceiver circuit 100, may cause the transceiver circuit 100 of the earphone 10 to connect to a host server 40 via an available infrastructure wireless network 30 when the data source 20 is not in wireless communication range with the earphone 10 via the ad hoc wireless network 24. The earphone 10 may receive streaming digital audio from the host server 40 via the infrastructure wireless network 30. In addition, the earphone 10 may receive a first network address for a first streaming digital audio content server 70 from the host server 40 via the infrastructure wireless network 30. In addition, the earphone 10 may comprise a user control, such as button 11, dial, pressure switch, or other type of user control, that, when activated, causes the earphone 10 to transmit an electronic request via the infrastructure wireless network 30 to the host server 40 for a second network address for a second streaming digital audio content server 70.

In other embodiments, the present invention is directed to a system that comprises: (i) a data source 20 for wirelessly transmitting streaming digital audio; and (ii) a wireless earphone 10 that is in wireless communication with the data source 20. In yet other embodiments, the present invention is directed to a communication system that comprises: (i) a host server 40; (ii) a first streaming digital audio content server 70 that is connected to the host server 40 via a data network

42; and (iii) a wireless earphone 10 that is in communication with the host server 40 via a wireless network 30. The host server 40 is programmed to transmit to the earphone 10 a first network address for the first streaming digital audio content server 70 on the data network 42. The host server 40 and the streaming digital audio content server(s) 70 each may comprise one or more processor circuits and one or more memory circuits (e.g., ROM circuits and/or RAM circuits).

In yet another embodiment, the present invention is directed to a headset that comprises: (i) a first earphone 10a that comprises one or more acoustic transducers 10b for converting a first electrical signal to sound; and (ii) a second earphone 10b, connected to the first earphone 10a, wherein the second earphone 10b comprises one or more acoustic transducers10b for converting a second electrical signal to sound. In one embodiment, the first earphone 10a comprises: (i) a first antenna 108; and (ii) a first transceiver circuit 100 in communication with the one or more acoustic transducers 106 of the first earphone 10a and in communication with the first antenna 108. The first transceiver circuit 100 is for receiving and transmitting wireless signals via the first antenna 108, and for outputting the first electrical signal to the one or more acoustic transducers 10b of the first earphone 10a. The first transceiver circuit 100 also may comprise firmware, which when executed by the first transceiver circuit 100, causes the first transceiver circuit 100 to: (i) receive digital audio wirelessly from a data source 20 via an ad hoc wireless network 24 when the data source 20 is in wireless communication range with the first earphone 10a via the ad hoc wireless network 24; and (ii) when the data source 20 is not in wireless communication range with the first earphone 10a via the ad hoc wireless network 24, transition automatically to receive digital audio via an infrastructure wireless network 30.

In various implementations, the headset further may comprise a head band 19 that is connected to the first and second earphones 10. In addition, the headset 19 further may comprise a microphone 104 having an output connected to the first transceiver circuit 100. In one embodiment, the first transceiver circuit 100 is for outputting the second electrical signal to the one or more acoustic transducers 106 of the second earphone 10b. In another embodiment, the second earphone 10b comprises: (i) a second antenna 108; and (ii) a second transceiver circuit 100 in communication with the one or more acoustic transducers 106 of the second earphone 10b and in communication with the second antenna 108. The second transceiver circuit 100 is for receiving and transmitting wireless signals via the second antenna 108, and for outputting the second electrical signal to the one or more acoustic transducers 106 of the second earphone 10b. The second transceiver circuit 100 may comprise firmware, which when executed by the second transceiver circuit 100, causes the second transceiver circuit 100 to: (i) receive digital audio wirelessly from the data source 20 via the ad hoc wireless network 24 when the data source 20 is

in wireless communication range with the second earphone10b via the ad hoc wireless network 24; and (ii) when the data source 20 is not in wireless communication range with the second earphone 10b via the ad hoc wireless network 24, transition automatically to receive digital audio via the infrastructure wireless network 30.

In addition, according to various embodiments, the first earphone 10a may comprise a first data port and the second earphone 10b may comprise a second data port. In addition, the headset may further comprise an adapter or dongle 150 connected to the first data port of the first earphone 10a and to the second data port of the second earphone 10b, wherein the adapter 150 comprises an output plug connector 152 for connecting to a remote device.

In addition, according to other embodiments, the present invention is directed to a method that comprises the steps of: (i) receiving, by a wireless earphone, via an ad hoc wireless network, digital audio from a data source when the data source is in wireless communication with the earphone via the ad hoc wireless network; (ii) converting, by the wireless earphone, the digital audio to sound; and (iii) when the data source is not in wireless communication with the earphone, transitioning automatically, by the earphone, to receive digital audio via an infrastructure wireless network.

In various implementations, the step of transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network may comprises transitioning automatically to receive digital audio from the data source via an infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network. In addition, the method may further comprise the step of receiving by the wireless earphone from the data source via the ad hoc wireless network data regarding one or more infrastructure wireless networks detected by data source when the earphone and the data source are communicating via the ad hoc wireless network.

In addition, the step of transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises may transitioning automatically to receive digital audio from a host sever via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network. Additionally, the step of transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network may comprise: (i) receiving, by the wireless earphone via the infrastructure wireless network, from a host server connected to the infrastructure wireless network, a network address for a streaming digital audio content server; and (ii) connecting, by the wireless earphone, to the streaming digital audio content server using the network address received from the host server.

It is to be understood that the figures and descriptions of the embodiments have been simplified to illustrate elements that are relevant for a clear understanding of the embodiments, while eliminating, for purposes of clarity, other elements. For example, certain operating system details for the various computer-related devices and systems are not described herein. Those of ordinary skill in the art will recognize, however, that these and other elements may be desirable in a typical processor or computer system. Because such elements are well known in the art and because they do not facilitate a better understanding of the embodiments, a discussion of such elements is not provided herein.

In general, it will be apparent to one of ordinary skill in the art that at least some of the embodiments described herein may be implemented in many different embodiments of software, firmware and/or hardware. The software and firmware code may be executed by a processor or any other similar computing device. The software code or specialized control hardware that may be used to implement embodiments is not limiting. For example, embodiments described herein may be implemented in computer software using any suitable computer software language type. Such software may be stored on any type of suitable computer-readable medium or media, such as, for example, a magnetic or optical storage medium. The operation and behavior of the embodiments may be described without specific reference to specific software code or specialized hardware components. The absence of such specific references is feasible, because it is clearly understood that artisans of ordinary skill would be able to design software and control hardware to implement the embodiments based on the present description with no more than reasonable effort and without undue experimentation.

Moreover, the processes associated with the present embodiments may be executed by programmable equipment, such as computers or computer systems and/or processors. Software that may cause programmable equipment to execute processes may be stored in any storage device, such as, for example, a computer system (nonvolatile) memory, an optical disk, magnetic tape, or magnetic disk. Furthermore, at least some of the processes may be programmed when the computer system is manufactured or stored on various types of computer-readable media.

A "computer," "computer system," "host," "host server," "server," or "processor" may be, for example and without limitation, a processor, microcomputer, minicomputer, server, mainframe, laptop, personal data assistant (PDA), wireless e-mail device, cellular phone, pager, processor, fax machine, scanner, or any other programmable device configured to transmit and/or receive data over a network. Such components may comprise: one or more processor circuits; and one more memory circuits, including ROM circuits and RAM circuits. Computer systems and computer-based devices disclosed herein may include memory for storing certain software

applications used in obtaining, processing, and communicating information. It can be appreciated that such memory may be internal or external with respect to operation of the disclosed embodiments. The memory may also include any means for storing software, including a hard disk, an optical disk, floppy disk, ROM (read only memory), RAM (random access memory), PROM (programmable ROM), EEPROM (electrically erasable PROM) and/or other computer-readable media.

In various embodiments disclosed herein, a single component may be replaced by multiple components and multiple components may be replaced by a single component to perform a given function or functions. Except where such substitution would not be operative, such substitution is within the intended scope of the embodiments. Any servers described herein, such as the host server 40, for example, may be replaced by a "server farm" or other grouping of networked servers (such as server blades) that are located and configured for cooperative functions. It can be appreciated that a server farm may serve to distribute workload between/among individual components of the farm and may expedite computing processes by harnessing the collective and cooperative power of multiple servers. Such server farms may employ load-balancing software that accomplishes tasks such as, for example, tracking demand for processing power from different machines, prioritizing and scheduling tasks based on network demand and/or providing backup contingency in the event of component failure or reduction in operability.

While various embodiments have been described herein, it should be apparent that various modifications, alterations, and adaptations to those embodiments may occur to persons skilled in the art with attainment of at least some of the advantages. ~~The disclosed embodiments are therefore intended to include all such modifications, alterations, and adaptations without departing from the scope of the embodiments as set forth herein.~~

CLAIMS

1. An earphone comprising:

a body, wherein the body comprises:

at least one acoustic transducer (106) for converting an analog electrical signal to sound;

an antenna (108); and

a transceiver circuit (100) in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:

receive digital audio wirelessly from a data source (20) via an ad hoc wireless network (24) after establishing a wireless communication link with the ad hoc wireless network and when the data source is in wireless communication range with the earphone via the ad hoc wireless network;

transmit ~~data~~ via the ad hoc wireless network to the data source, data regarding one or more infrastructure wireless networks detected by the transceiver circuit that have a signal strength above a threshold minimum signal strength level when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data for the one or more infrastructure wireless networks; and

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive digital audio via a first infrastructure wireless network (33), the earphone being characterised in that the transceiver circuit ~~is for receiving~~ receives digital audio from the data source via the first infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

2. The earphone of claim 1, wherein the transceiver circuit comprises:

a wireless communication module;

a processor unit in communication with the wireless communication module;

a non-volatile memory unit in communication with the processor unit; and

a volatile memory unit in communication with the processor unit.

3. The earphone of claim 2, wherein the wireless communication module comprises a Wi-Fi communication module.

4. The earphone of claim 1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second

infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication via the first infrastructure wireless network.

5. The earphone of claim 1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

6. The earphone of claim 5, wherein the earphone is for receiving streaming digital audio from the host server via the infrastructure wireless network.

7. The earphone of claim 5, wherein the earphone is for receiving a first network address for a first streaming digital audio content server from the host server via the infrastructure wireless network.

8. The earphone of claim 7, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

9. The earphone of claim 8, wherein the user control comprises a button.

10. A system comprising:
a wireless earphone according to claim 1; and
a said data source for wirelessly transmitting streaming digital audio.

11. A system according to claim 10, further comprising a host server that is in communication with the wireless earphone via the infrastructure wireless network.

12. A system according to claim 11, wherein the firmware of the transceiver circuit of the wireless earphone, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to the host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

13. A system according to claim 11, wherein the host server is for streaming digital audio to the earphone via the infrastructure wireless network.

14. A system according to claim 11, wherein the host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the infrastructure wireless network.

15. A system according to claim 12 further comprising a web page for the wireless earphone through which a user is capable of configuring one or more settings for the wireless earphone.

16. A system according to claim 10, or an earphone according to claim 1, wherein the data source comprises a digital audio player.

17. A system according to claim 10, or an earphone according to claim 1, wherein the infrastructure wireless network comprises a WLAN.

18. A system according to claim 10, or an earphone according to claim 1, wherein the infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.

19. A method of receiving wireless digital audio by a wireless earphone, the wireless earphone comprising:

a body, wherein the body comprises:

at least one acoustic transducer for converting an analog electrical signal to sound; an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and

wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and

wherein the wireless transceiver circuit comprises firmware, and

wherein the method comprises: after establishing a wireless communication link with an ad hoc wireless network,

receiving, by the wireless earphone, via the ad hoc wireless network, digital audio from a data source when the data source is in wireless communication with the earphone via the ad hoc wireless network;

transmitting ~~data~~, by the wireless earphone, via the ad hoc wireless network to the data

source, data regarding one or more infrastructure wireless networks detected by the transceiver circuit that have a signal strength above a threshold minimum signal strength level when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data for the one or more infrastructure wireless networks;

converting, by the wireless earphone, the digital audio to sound the method being characterised by:

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transitioning automatically, by the earphone, to receive digital audio via a first infrastructure wireless network, and receiving digital audio from the data source via the first infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

20. The method of claim 19, wherein transitioning automatically by the earphone to receive digital audio via the first infrastructure wireless network comprises transitioning automatically to receive digital audio from a host sever via the first infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

21. The method of claim 19, wherein transitioning automatically by the earphone to receive digital audio via the first infrastructure wireless network comprises:

receiving, by the wireless earphone via the first infrastructure wireless network, from a host server connected to the first infrastructure wireless network, a network address for a streaming digital audio content server; and

connecting, by the wireless earphone, to the streaming digital audio content server using the network address received from the host server.

1/16

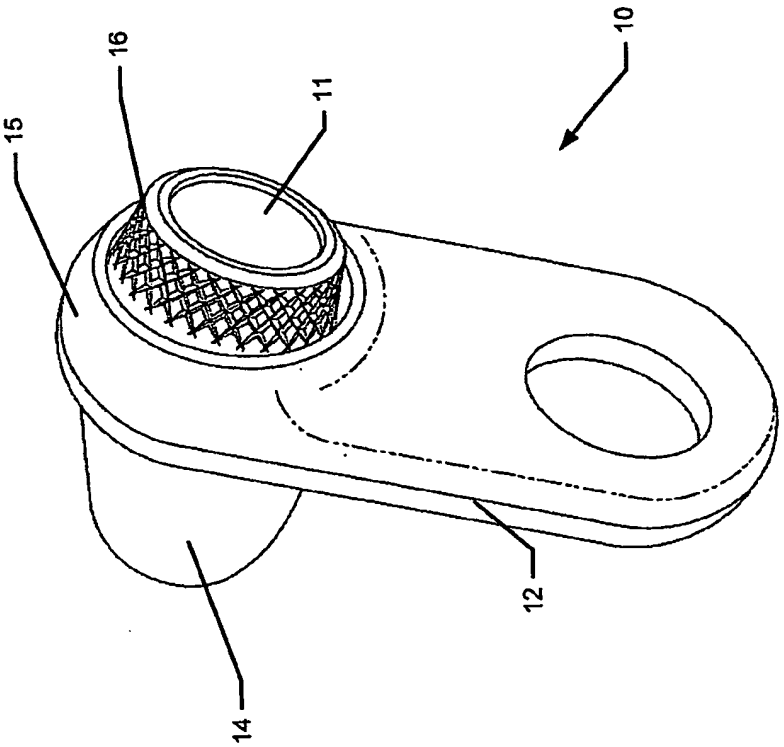

Fig. 1B

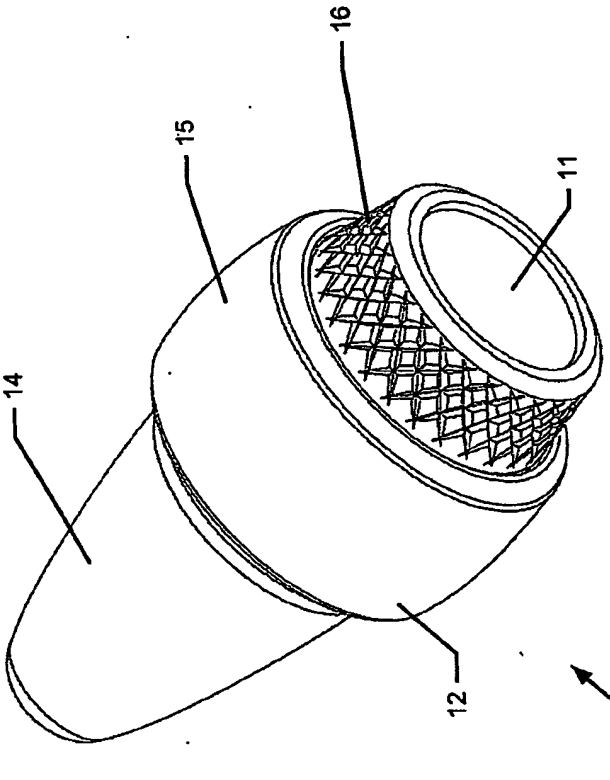

Fig. 1A

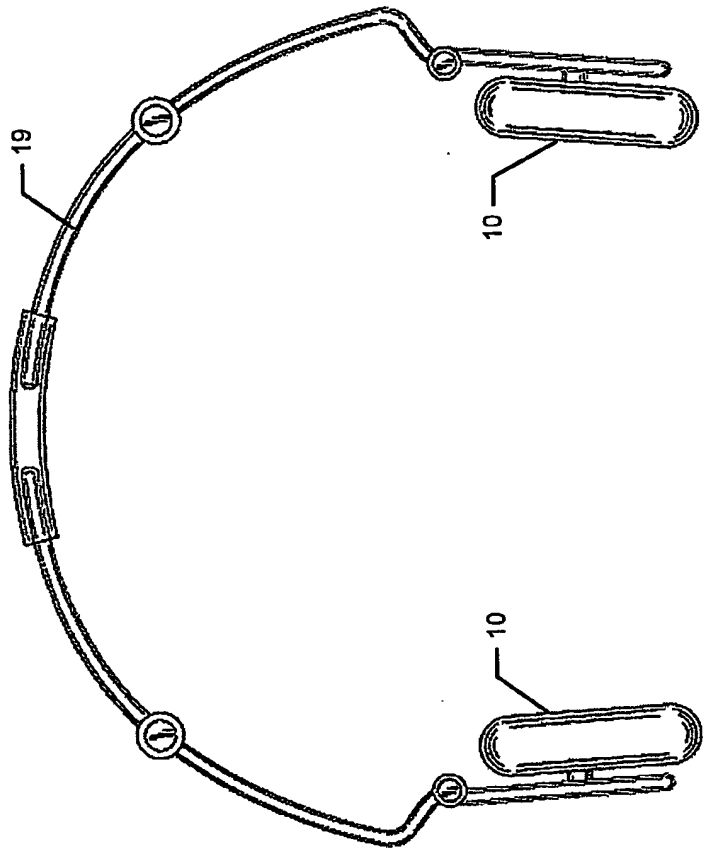

Fig. 1C

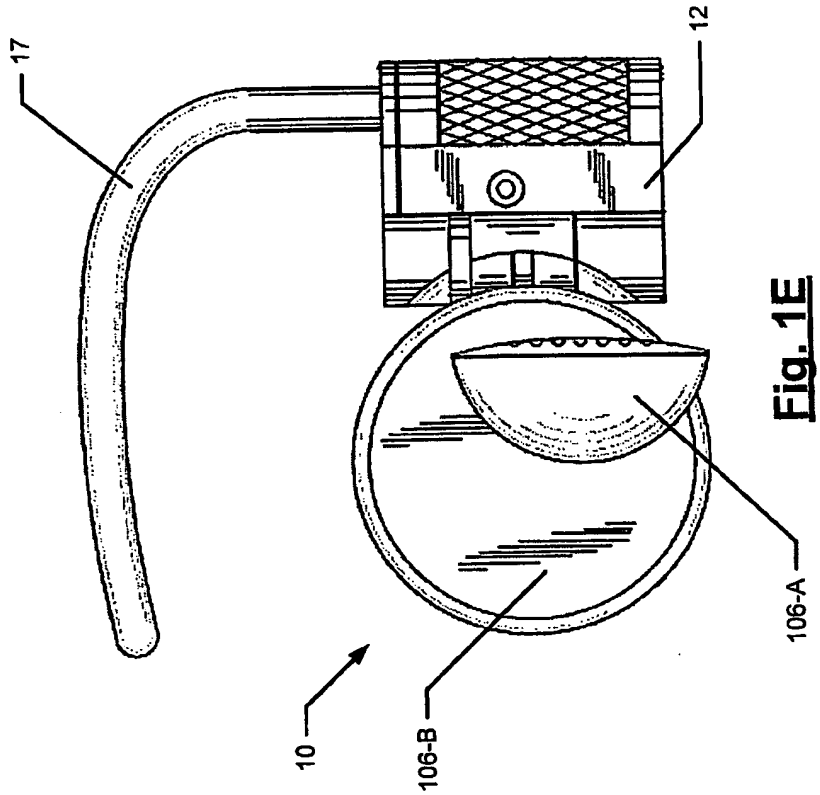

Fig. 1E

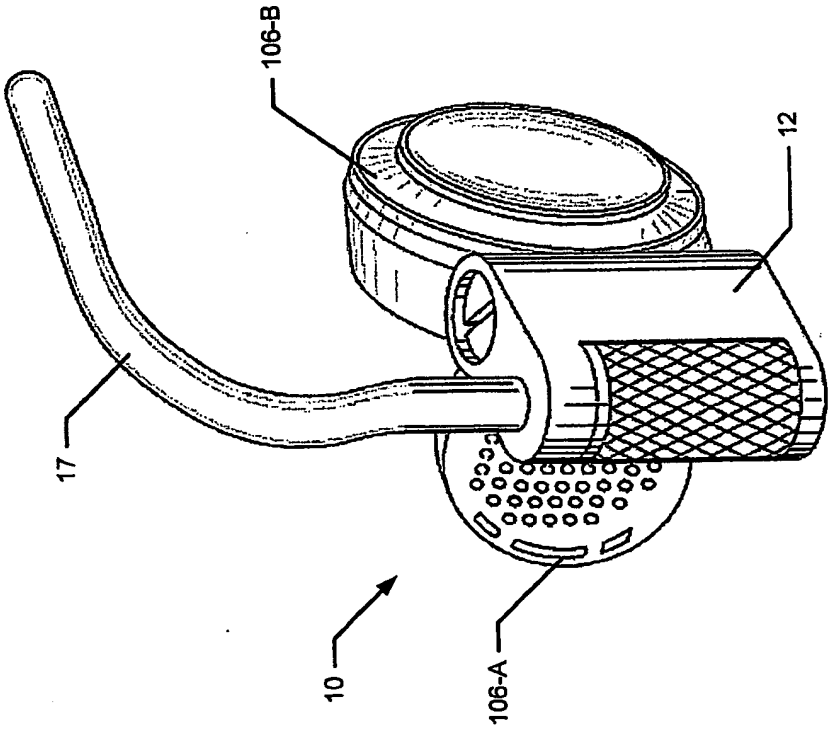

Fig. 1D

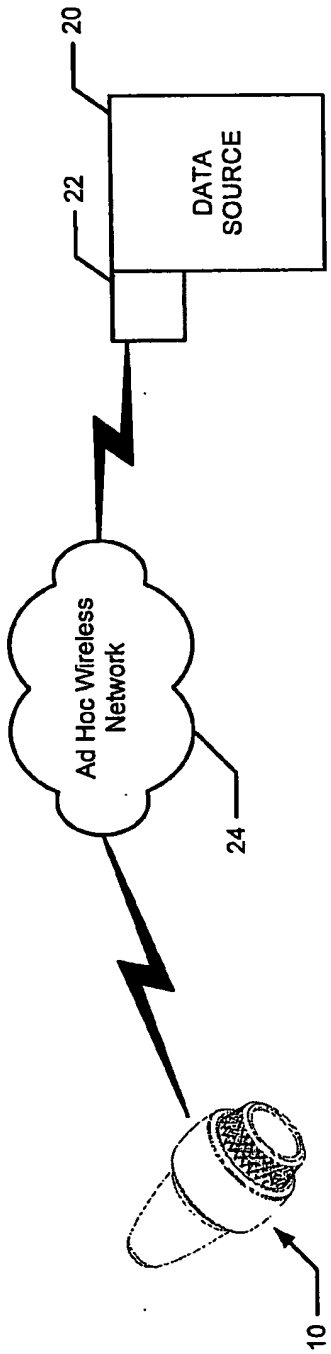

Fig. 2A

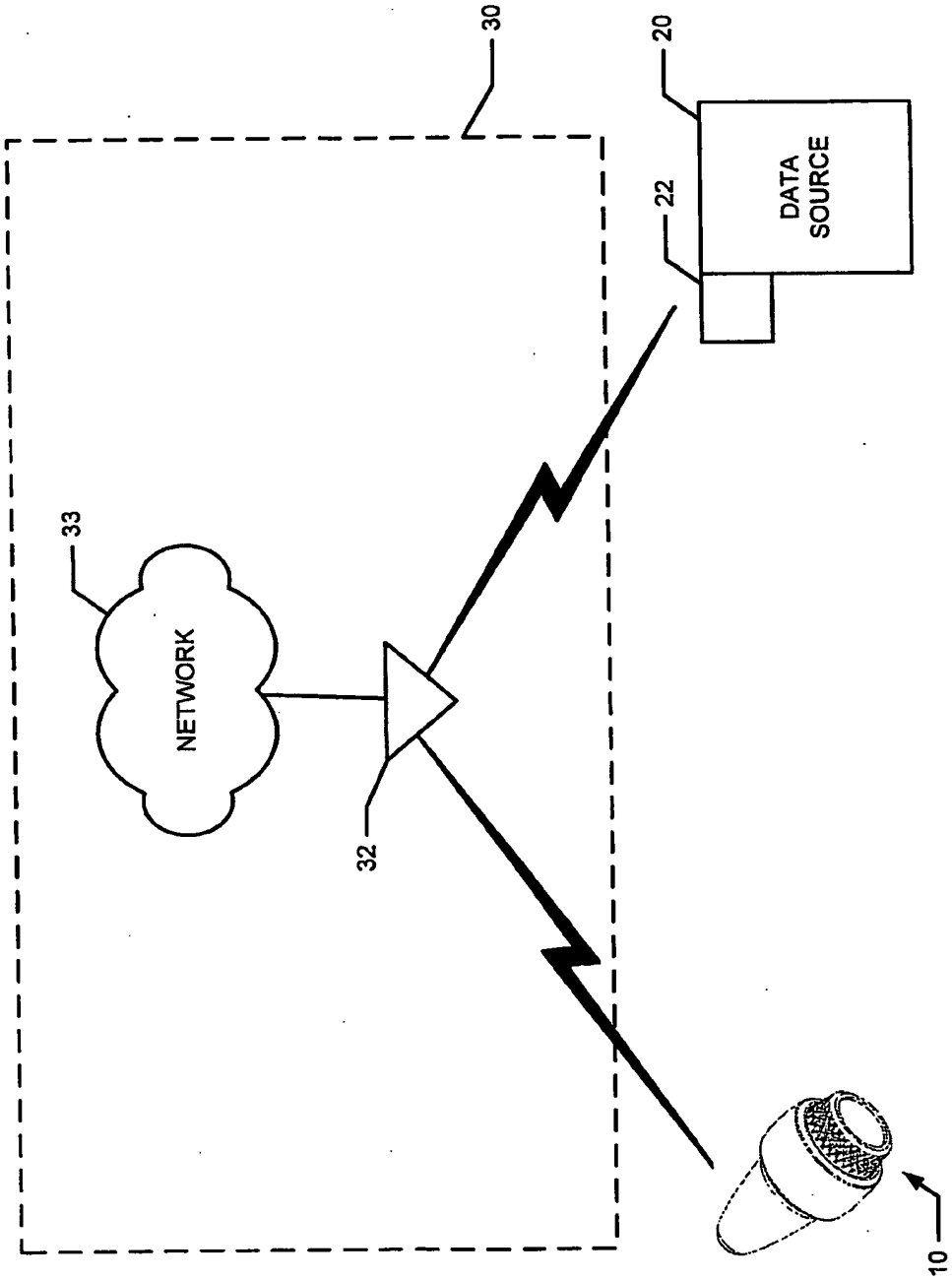

Fig. 2B

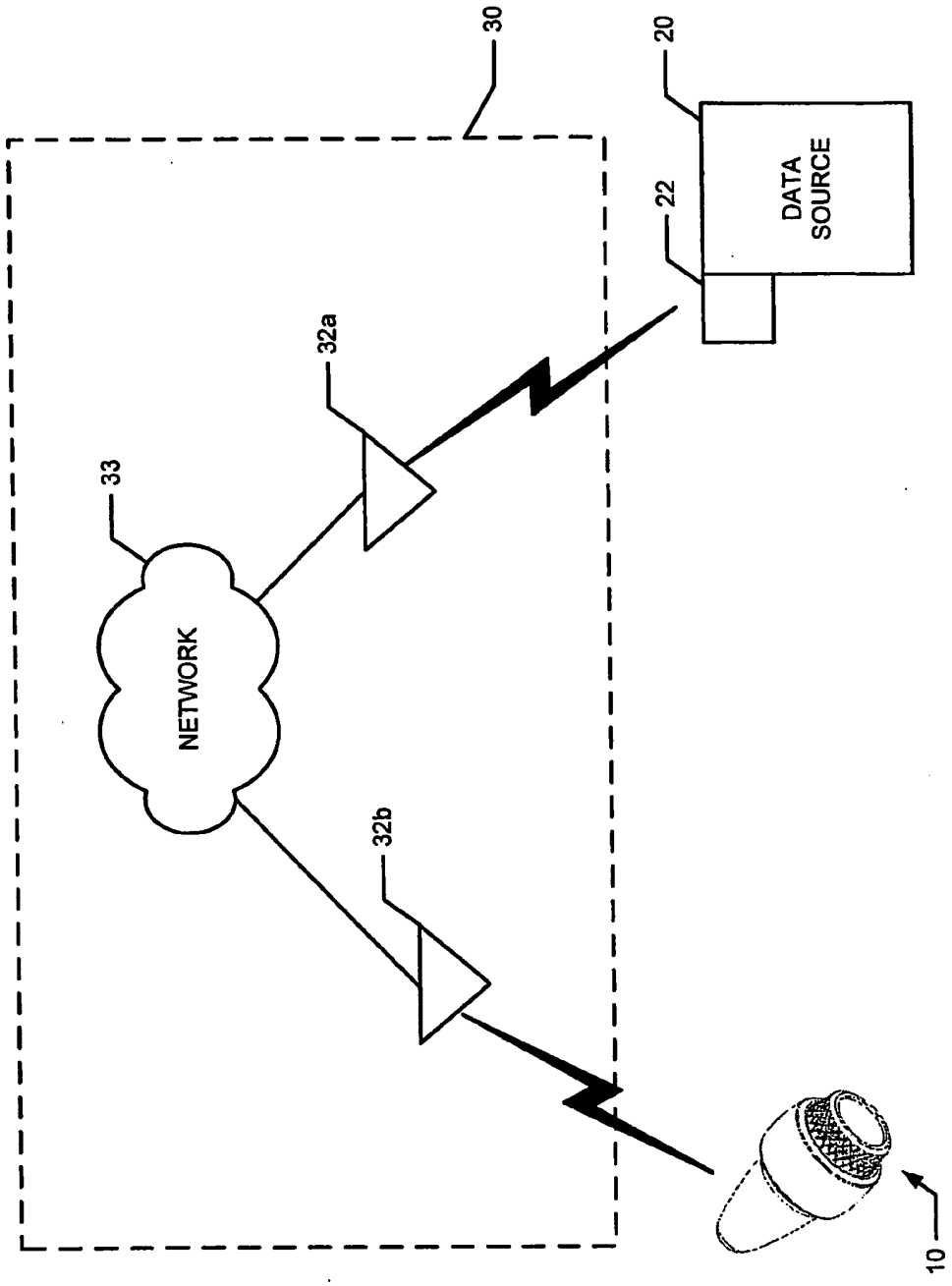

Fig. 2C

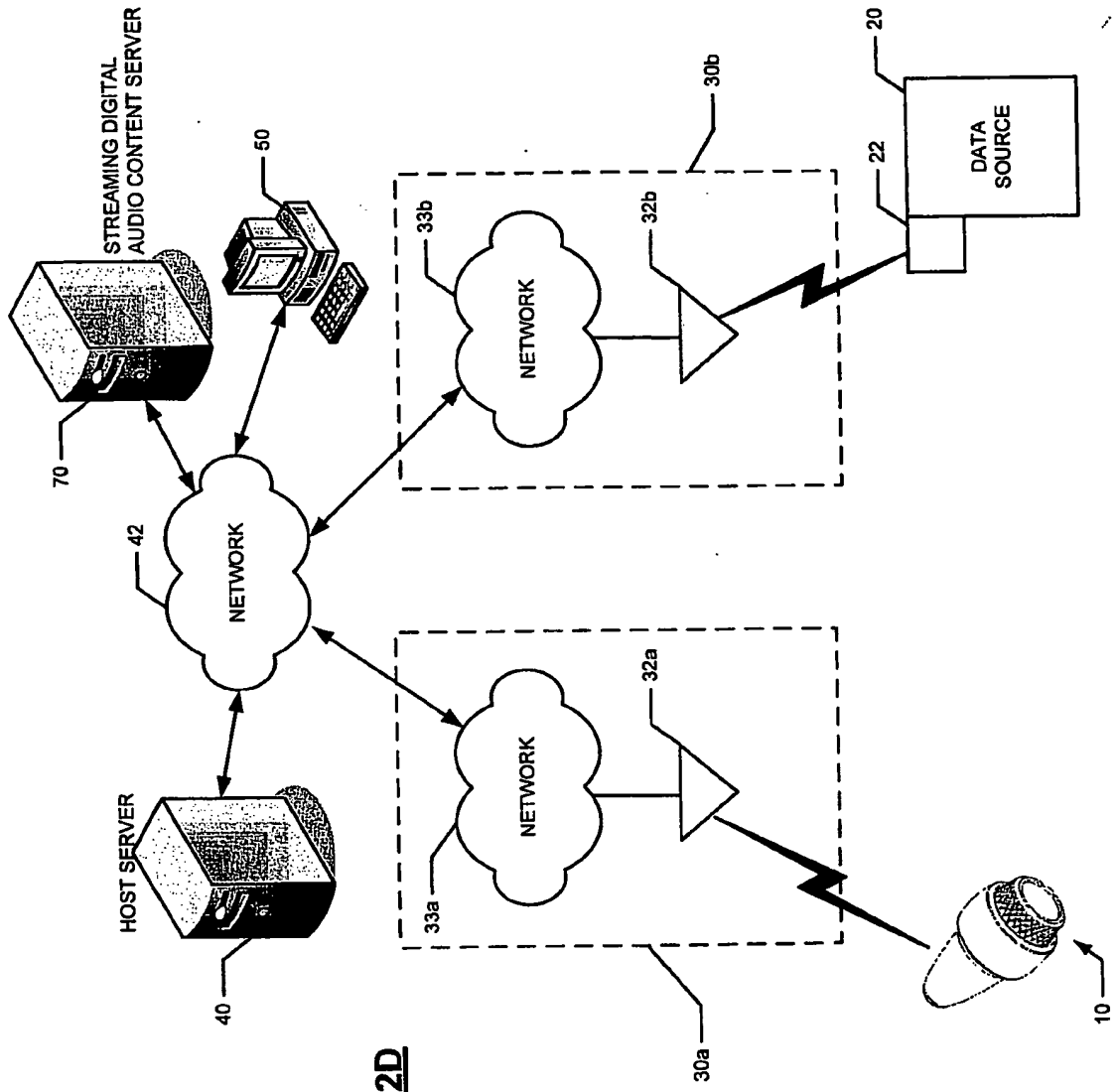
STREAMING DIGITAL AUDIO CONTENT SERVER
50
70
NETWORK
42
HOST SERVER
40
33b
NETWORK
32b
30b
20
22
DATA SOURCE
33a
NETWORK
32a
30a
10

Fig. 2D

8/16

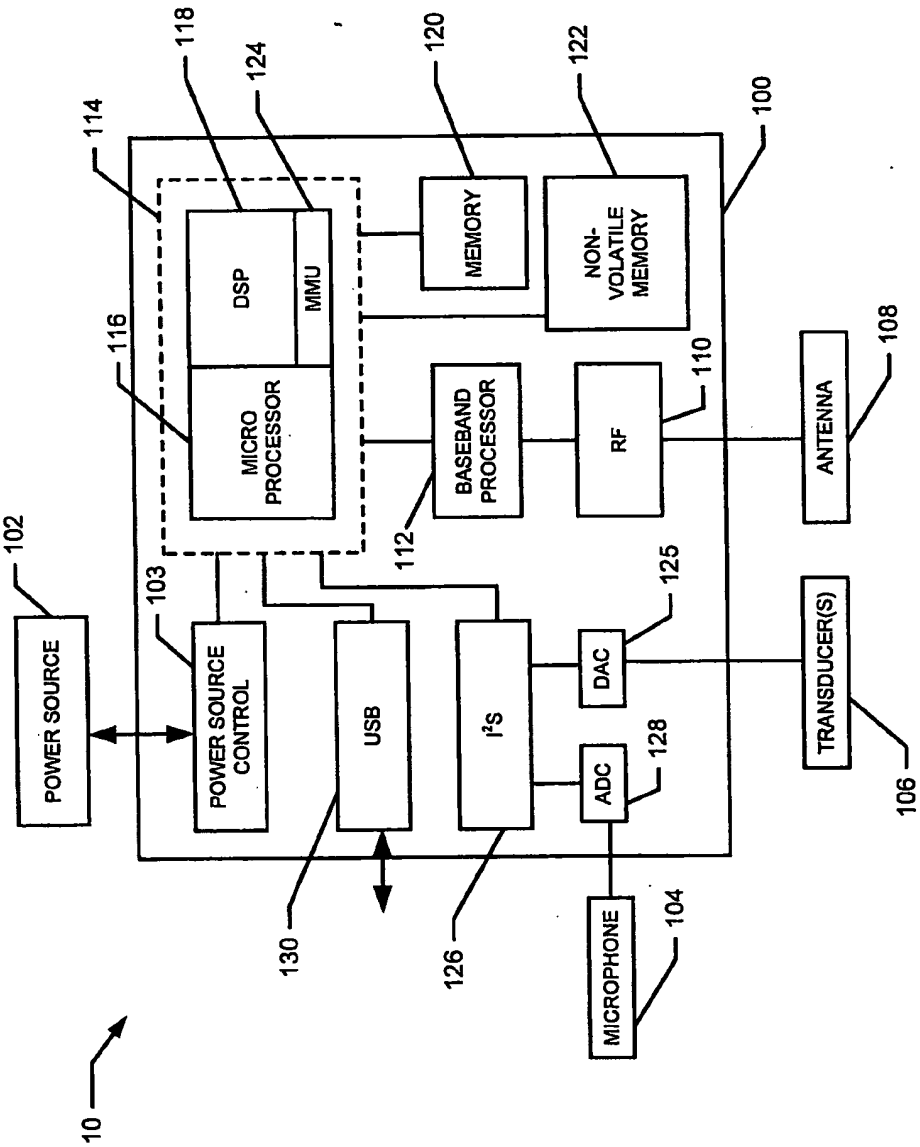

Fig. 3

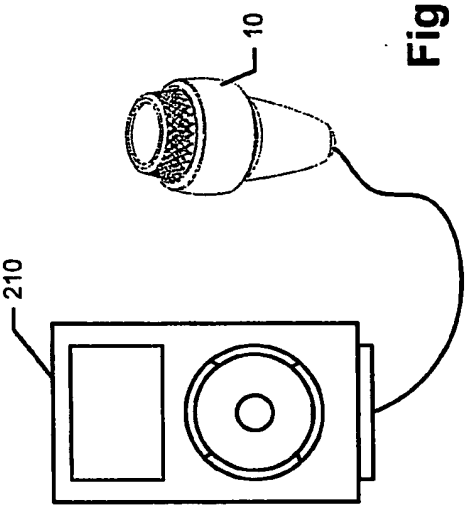

Fig. 4B

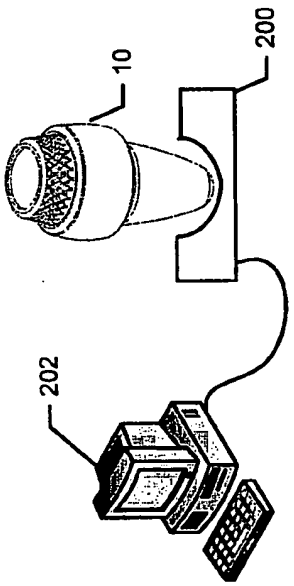

Fig. 4A

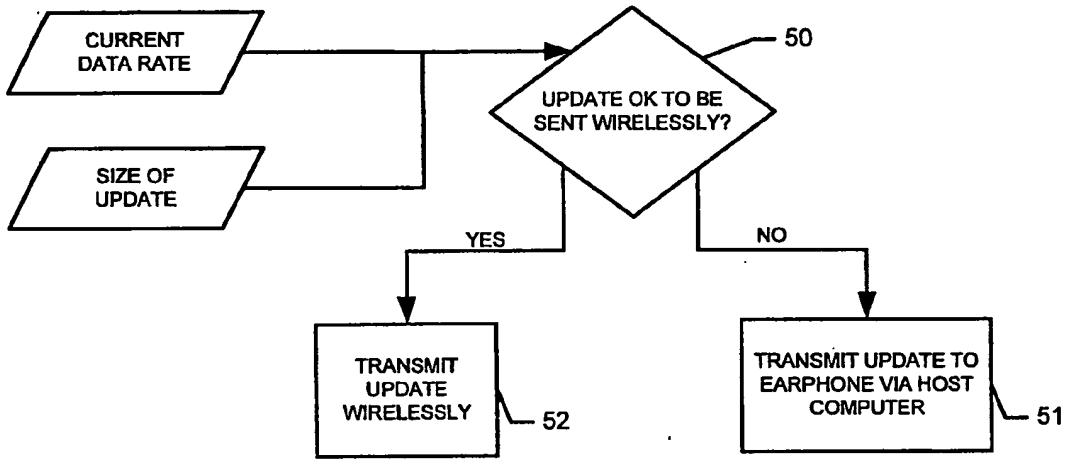
CURRENT DATA RATE
SIZE OF UPDATE
UPDATE OK TO BE SENT WIRELESSLY?
50
YES
NO
TRANSMIT UPDATE WIRELESSLY
52
TRANSMIT UPDATE TO EARPHONE VIA HOST COMPUTER
51

Fig. 5

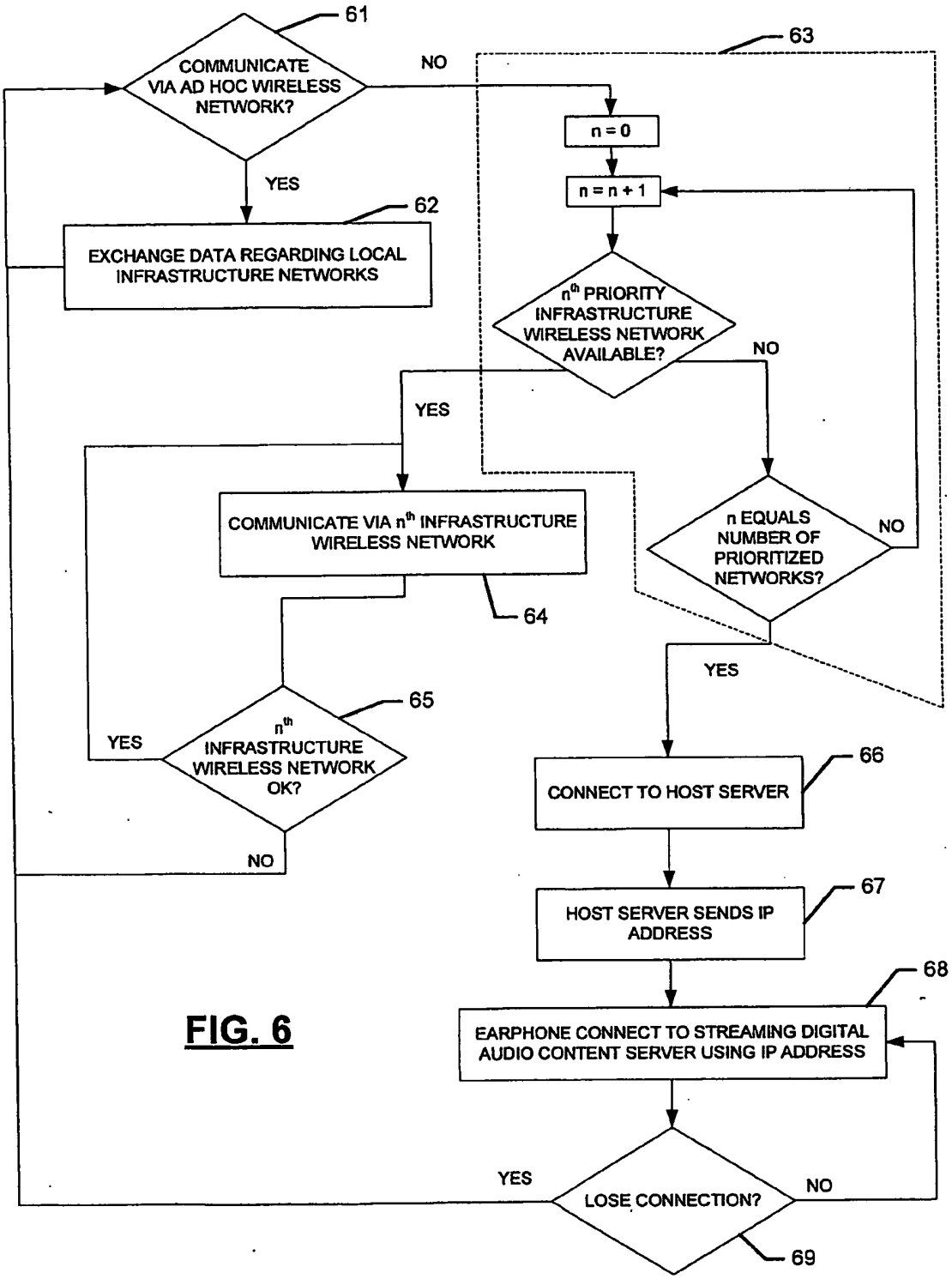

FIG. 6

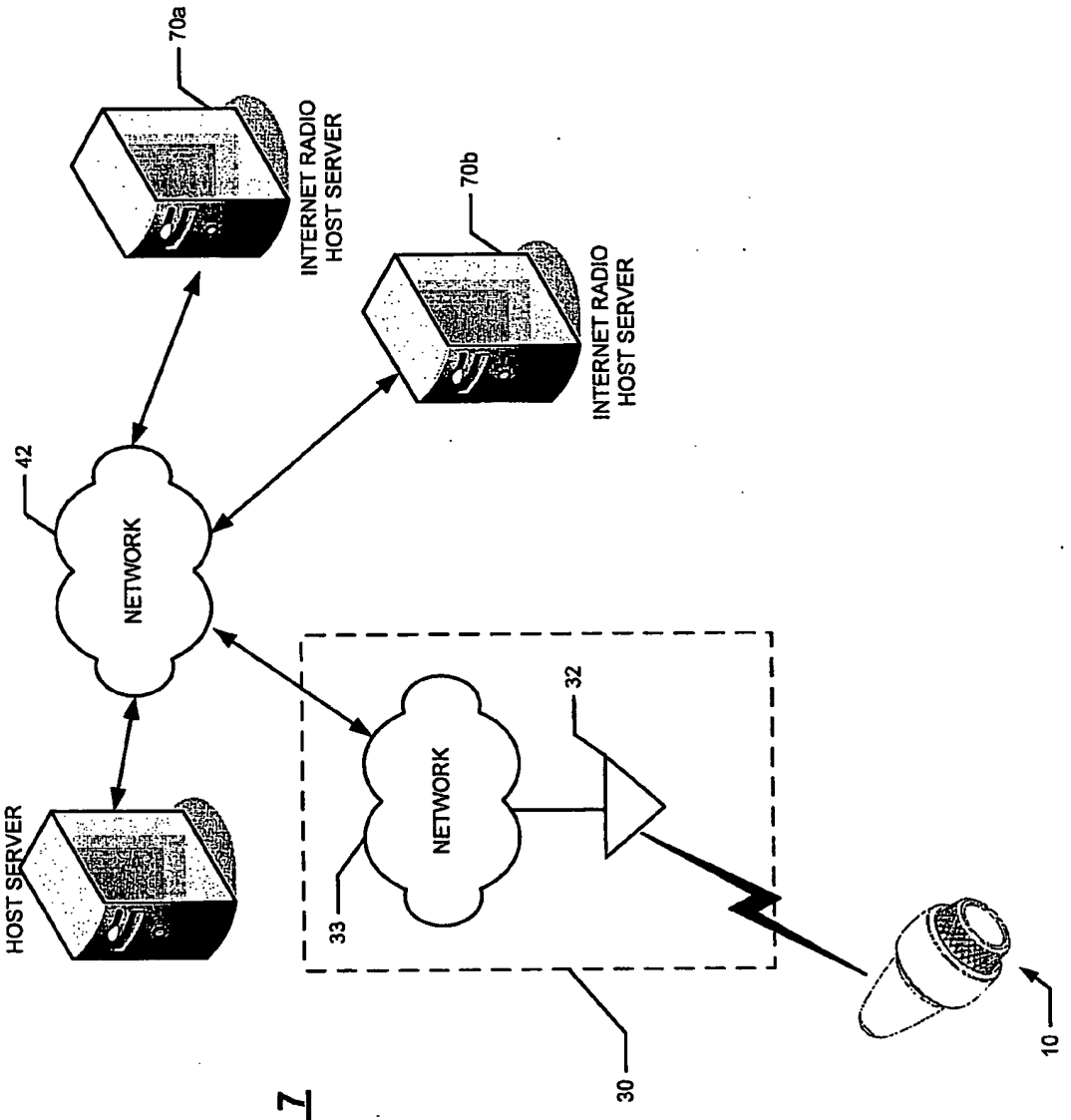

Fig. 7

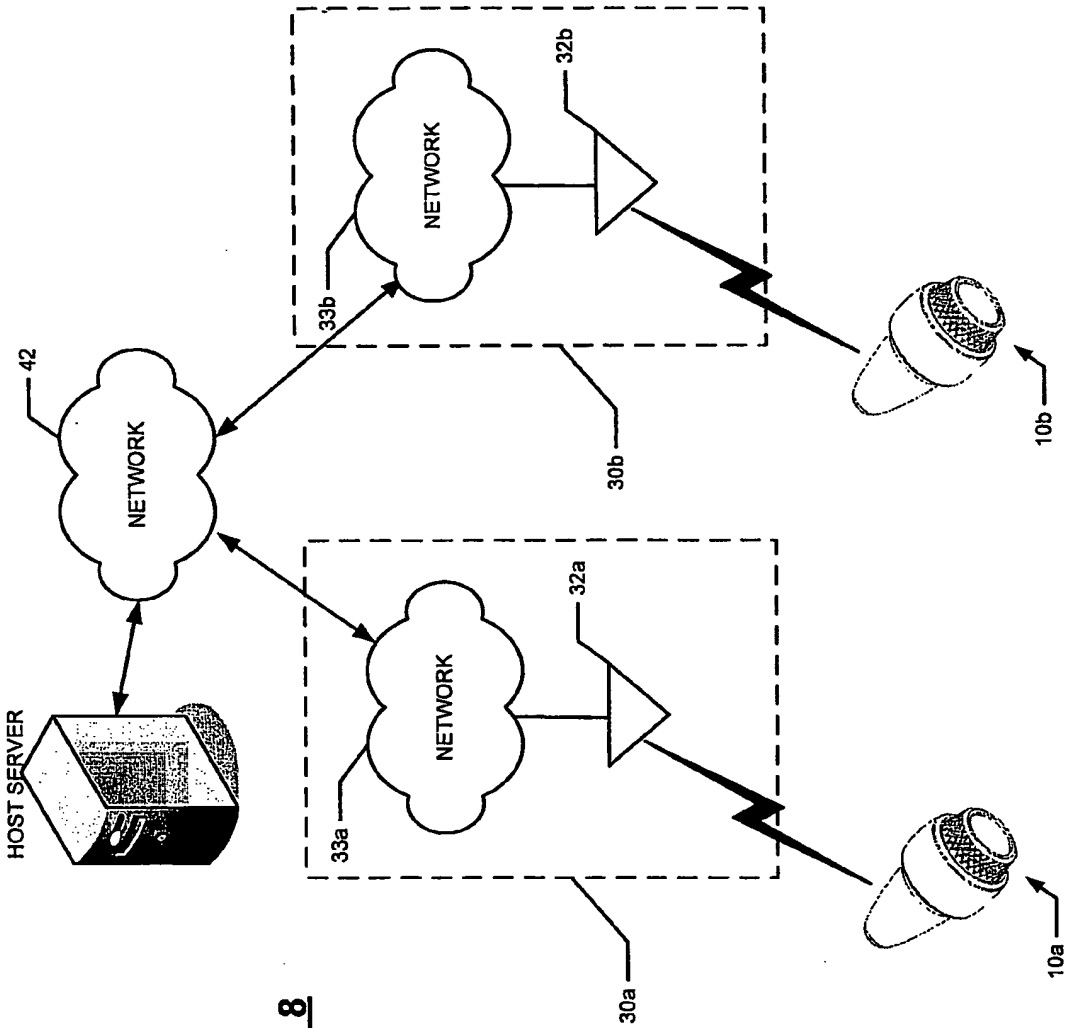
NETWORK
32b
33b
30b
10b
42
NETWORK
HOST SERVER
NETWORK
32a
33a
30a
10a

Fig. 8

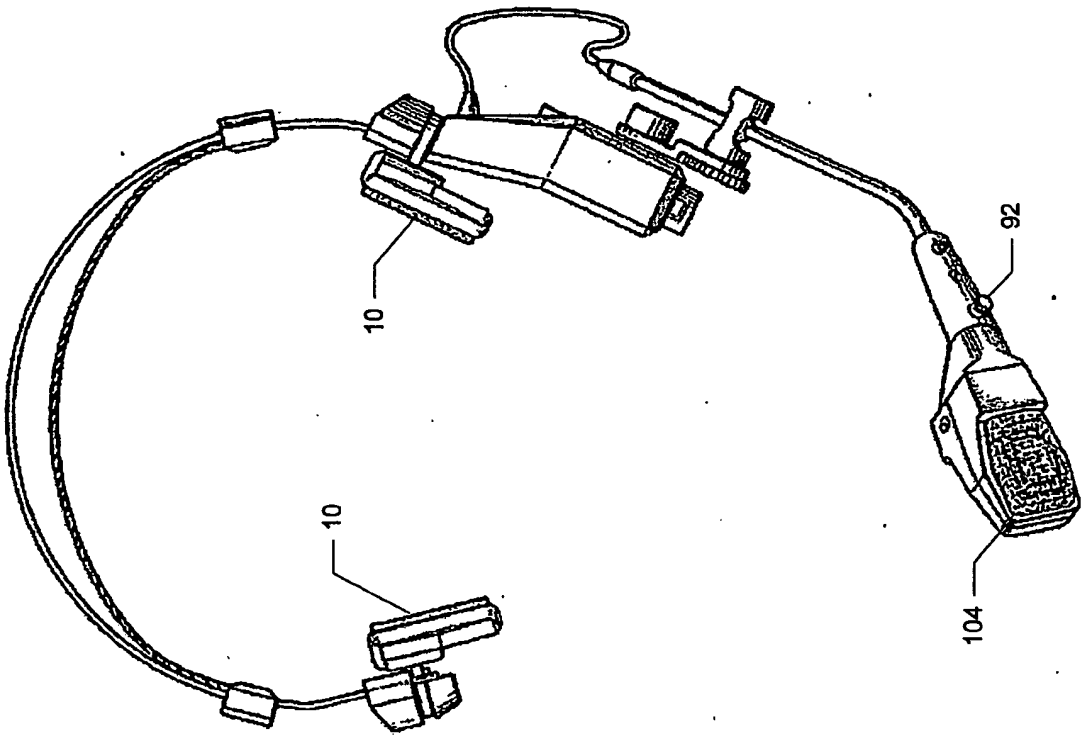

Fig. 9

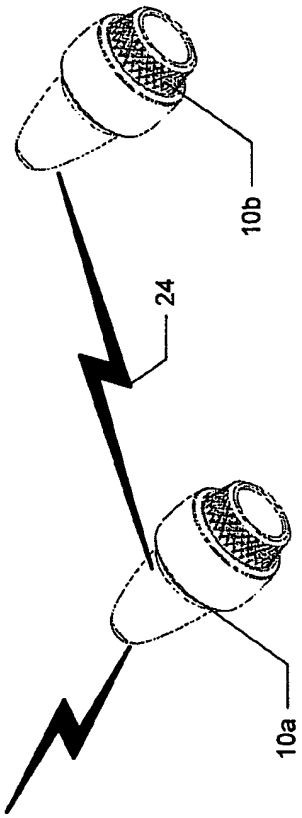

Fig. 10

16/16

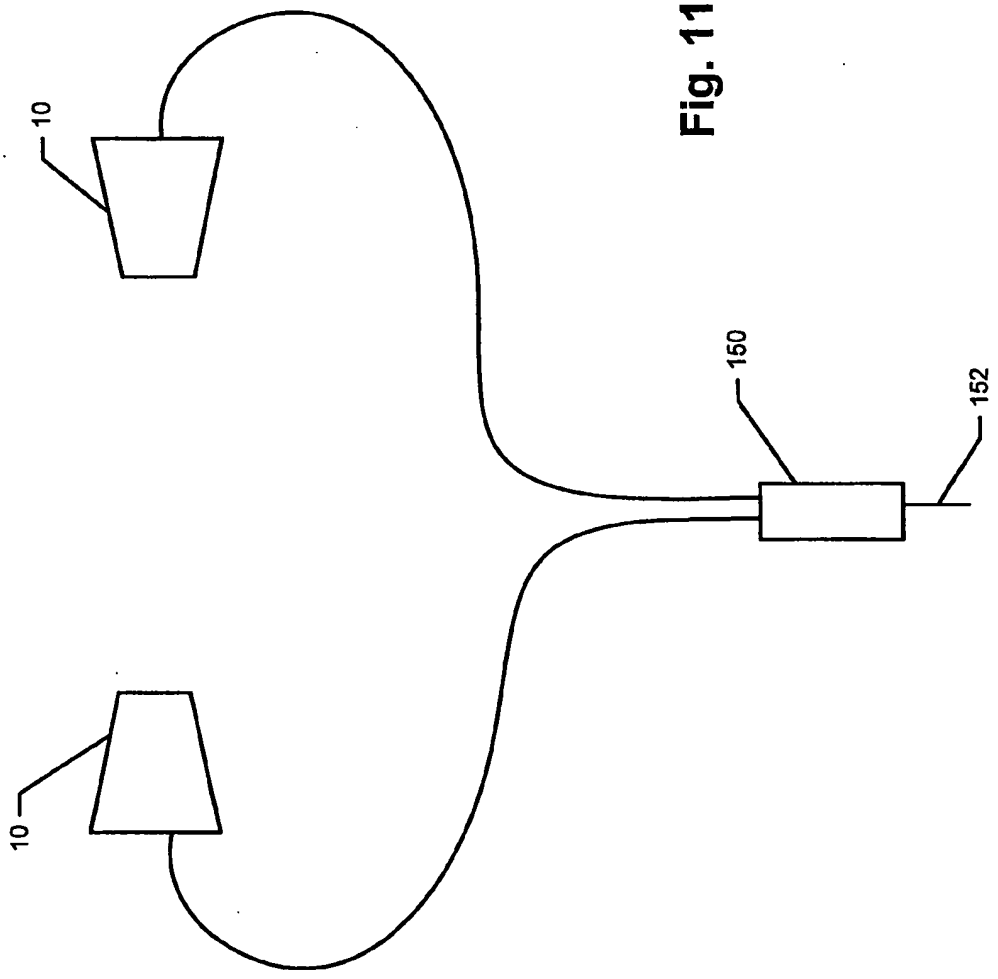

Fig. 11

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the following subsequently filed document(s):

Submission number	1417526
Application number	EP09731146.8
Date of receipt	30 November 2011
Receiving Office	European Patent Office, The Hague
Your reference	SJP/FP6724736
Applicant	All applicants as on file

Documents submitted	
package-data.xml	ep-sfd-request.xml
epf1038.pdf (1 p.)	WOREPLY-1.PDF\#10078388-v1-To_EPO_-_30_11_2011_-_response.PDF (3 p.)
DESC-1.PDF\#10080127-v1-To_EPO_-_30_11_2011_-_replacement_pages.PDF (2 p.)	CLMS-1.PDF\10080295-v1-To_EPO_-_30_11_2011_-_replacement_claims.PDF (4 p.)
DESC-HWA-1.PDF\#10080373-v1-To_EPO_-_30_11_2011_-_description (manuscript) .PDF (1 p.)	CLMS-HWA-1.PDF\#10074291-v1-To_EPO_-_30_11_2011_-_claims_(manuscript).PDF (4 p.)

Submitted by	CN=S. Parry 20806,O=Mewburn Ellis LLP,C=GB
Method of submission	Online
Date and time receipt generated	30 November 2011, 13:58 (CET)
Message Digest	3D:93:B4:54:4B:10:19:F9:3E:F4:35:C4:0C:7D:64:FA:D1:ED:D4:7C

Correction by the EPO of errors in debit instructions filed by eOLF

Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated

software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

CLAIMS

1. An earphone comprising:

a body, wherein the body comprises:

at least one acoustic transducer for converting an analog electrical signal to sound;

an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:

receive digital audio wirelessly from a data source via an ad hoc wireless network after establishing a wireless communication link with the ad hoc wireless network and when the data source is in wireless communication range with the earphone via the ad hoc wireless network;

transmit data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit that have a signal strength above a threshold minimum signal strength level when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data for the one or more infrastructure wireless networks; and

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive digital audio via a first infrastructure wireless network, the earphone being characterised in that the transceiver circuit is for receiving digital audio from the data source via the first infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

2. The earphone of claim 1, wherein the transceiver circuit comprises:

a wireless communication module;

a processor unit in communication with the wireless communication module;

a non-volatile memory unit in communication with the processor unit; and

a volatile memory unit in communication with the processor unit.

3. The earphone of claim 2, wherein the wireless communication module comprises a Wi-Fi communication module.

4. The earphone of claim 1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second

infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication via the first infrastructure wireless network.

5. The earphone of claim 1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

6. The earphone of claim 5, wherein the earphone is for receiving streaming digital audio from the host server via the infrastructure wireless network.

7. The earphone of claim 5, wherein the earphone is for receiving a first network address for a first streaming digital audio content server from the host server via the infrastructure wireless network.

8. The earphone of claim 7, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

9. The earphone of claim 8, wherein the user control comprises a button.

10. A system comprising:
a wireless earphone according to claim 1; and
a said data source for wirelessly transmitting streaming digital audio.

11. A system according to claim 10, further comprising a host server that is in communication with the wireless earphone via the infrastructure wireless network.

12. A system according to claim 11, wherein the firmware of the transceiver circuit of the wireless earphone, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to the host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

13. A system according to claim 11, wherein the host server is for streaming digital audio to the earphone via the infrastructure wireless network.

14. A system according to claim 11, wherein the host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the infrastructure wireless network.

15. A system according to claim 12 further comprising a web page for the wireless earphone through which a user is capable of configuring one or more settings for the wireless earphone.

16. A system according to claim 10, or an earphone according to claim 1, wherein the data source comprises a digital audio player.

17. A system according to claim 10, or an earphone according to claim 1, wherein the infrastructure wireless network comprises a WLAN.

18. A system according to claim 10, or an earphone according to claim 1, wherein the infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.

19. A method of receiving wireless digital audio by a wireless earphone, the wireless earphone comprising:

a body, wherein the body comprises:

at least one acoustic transducer for converting an analog electrical signal to sound; an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and

wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and

wherein the wireless transceiver circuit comprises firmware, and

wherein the method comprises: after establishing a wireless communication link with an ad hoc wireless network,

receiving, by the wireless earphone, via the ad hoc wireless network, digital audio from a data source when the data source is in wireless communication with the earphone via the ad hoc wireless network;

transmitting data, by the wireless earphone, via the ad hoc wireless network to the data

source regarding one or more infrastructure wireless networks detected by the transceiver circuit that have a signal strength above a threshold minimum signal strength level when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data for the one or more infrastructure wireless networks;

converting, by the wireless earphone, the digital audio to sound the method being characterised by:

when the data source is not in wireless communication with the earphone, transitioning automatically, by the earphone, to receive digital audio via a first infrastructure wireless network, and receiving digital audio from the data source via the first infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

20. The method of claim 19, wherein transitioning automatically by the earphone to receive digital audio via the first infrastructure wireless network comprises transitioning automatically to receive digital audio from a host sever via the first infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

21. The method of claim 19, wherein transitioning automatically by the earphone to receive digital audio via the first infrastructure wireless network comprises:

receiving, by the wireless earphone via the first infrastructure wireless network, from a host server connected to the first infrastructure wireless network, a network address for a streaming digital audio content server; and

connecting, by the wireless earphone, to the streaming digital audio content server using the network address received from the host server.

CLAIMS

What is claimed is:

1. An earphone comprising:

a body, wherein the body comprises:

at least one acoustic transducer for converting an analog electrical signal to sound;

an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:

receive digital audio wirelessly from a data source via an ad hoc wireless network when the data source is in wireless communication range with the earphone via the ad hoc wireless network;

transmit data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data ~~and signal strength data~~ for the one or more infrastructure wireless networks; and

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive digital audio via ~~an~~ a first infrastructure wireless network.

2. The earphone of claim 1, wherein the transceiver circuit comprises:

a wireless communication module;

a processor unit in communication with the wireless communication module;

a non-volatile memory unit in communication with the processor unit; and

a volatile memory unit in communication with the processor unit.

3. The earphone of claim 2, wherein the wireless communication module comprises a Wi-Fi communication module.

4. ~~The earphone of any preceding~~ claim 1 ~~wherein~~ the transceiver circuit is for receiving digital audio from the data source via the first infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

5. The earphone of ~~any preceding~~ claim 1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication via the ~~pre-set~~ first infrastructure wireless network.

6. The earphone of ~~any preceding~~ claim 1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

7. The earphone of claim ~~5 or claim~~ 6, wherein the earphone is for receiving streaming digital audio from the host server via the infrastructure wireless network.

8. The earphone of ~~any one of~~ claim ~~5 to 7~~ 5, wherein the earphone is for receiving a first network address for a first streaming digital audio content server from the host server via the infrastructure wireless network.

9. The earphone of claim 7, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

10. The earphone of claim 8, wherein the user control comprises a button.

11. A system comprising:

a wireless earphone according to ~~any preceding~~ claim 1; and

a said data source for wirelessly transmitting streaming digital audio.

12. A system according to claim 10, further comprising a host server that is in communication with the wireless earphone via the infrastructure wireless network.

13. A system according to claim ~~11 or claim~~ 12, wherein the firmware of the transceiver circuit of the wireless earphone, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to the host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

14. A system according to claim ~~12 or claim~~ 13 ~~, or an earphone according to any one of claims 5 to 10~~, wherein the host server is for streaming digital audio to the earphone via the infrastructure wireless network.

15. A system according to ~~any one of~~ claim ~~12 to 14; or an earphone according to any one of claims 5 to 10~~ 11, wherein the host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the infrastructure wireless network.

15 16. A system according to ~~any one of~~ claims ~~1 to 15~~ further comprising a web page for the wireless earphone through which a user is capable of configuring one or more settings for the wireless earphone.

16 17. A system ~~of~~ earphone according ~~to any preceding claim~~, wherein the data source comprises a digital audio player.

17 18. A system ~~of~~ earphone according to ~~any preceding~~ claim, wherein the infrastructure wireless network comprises a WLAN.

18 19. A system ~~or~~ earphone according to ~~any preceding~~ claim, wherein the infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.

19 20. A method ~~comprising~~

receiving, by ~~a~~ the wireless earphone, via ~~an~~ the ad hoc wireless network, digital audio from a data source when the data source is in wireless communication with the earphone via the ad hoc wireless network;

transmitting data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data ~~and signal strength data~~ for the one or more infrastructure wireless networks;

converting, by the wireless earphone, the digital audio to sound; ~~and~~

when the data source is not in wireless communication with the earphone, transitioning automatically, by the earphone, to receive digital audio via ~~an~~ a first infrastructure wireless network, and receiving

~~21. The method of claim 20, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises transitioning automatically to receive~~ digital audio from the data source via ~~an~~ the first infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

20 ~~22~~. The method of claim ~~20~~ 19, wherein transitioning automatically by the earphone to receive digital audio via ~~an~~ the first infrastructure wireless network comprises transitioning automatically to receive digital audio from a host sever via the first infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

21 ~~23~~. The method of claim ~~20~~ 19, wherein transitioning automatically by the earphone to receive digital audio via ~~an~~ the first infrastructure wireless network comprises:

receiving, by the wireless earphone via the first infrastructure wireless network, from a host server connected to the first infrastructure wireless network, a network address for a streaming

digital audio content server; and

connecting, by the wireless earphone, to the streaming digital audio content server using the network address received from the host server.

WIRELESS EARPHONE THAT TRANSITIONS BETWEEN WIRELESS NETWORKS

Inventors: Michael J. Pelland, Michael J. Koss, Michael Sagan, Steven Reckamp, Greg Hollingstad, Jeff Bovee, and Morgan Lowery

PRIORITY CLAIM

The present application claims priority to United States provisional application serial number 61/123,265, filed April 7, 2008, which is incorporated herein by reference.

BACKGROUND

Digital audio players, such as MP3 players and iPods, that store and play digital audio files, are very popular. Such devices typically comprise a data storage unit for storing and playing the digital audio, and a headphone set that connects to the data storage unit, usually with a 1/4" or a 3.5 mm jack and associated cord. Often the headphones are in-ear type headphones. The cord, however, between the headphones and the data storage unit can be cumbersome and annoying to users, and the length of the cord limits the physical distance between the data storage unit and the headphones. Accordingly, some cordless headphones have been proposed, such as the Monster iFreePlay cordless headphones from Apple Inc., which include a docking port on one of the earphones that can connect directly to an iPod Shuffle. Because they have the docking port, however, the Monster iFreePlay cordless headphones from Apple are quite large and are not in- ear type phones. Recently, cordless headphones that connect wirelessly via IEEE 802.11 to a WLAN-ready laptop or personal computer (PC) have been proposed, but such headphones are also quite large and not in-ear type phones.

US2007/0165875A1 discloses a multiple-antennae wireless multimedia headset having peer-to-peer networking capability and which is configured for convenient hand off between multiple wireless interfaces.

According to a first aspect of the present invention, there is provided an earphone as defined in claim 1.

According to a second aspect of the present invention, there is provided a method as defined in claim 19

When the data source and the earphone are out of range via the ad hoc wireless network, they may transition automatically to a common infrastructure wireless network (e.g., a wireless LAN). If there is no common infrastructure wireless network for both the data source and the earphone, the earphone may connect via an available infrastructure wireless network to a host server. The host server may, for example, broadcast streaming audio to the earphone and/or transmit to the earphone a network address (e.g., an Internet Protocol (IP) address) for a network-connected content server that

// According to a first aspect of the present invention, there is provided an earphone as defined in claim 1.

// According to a second aspect of the present invention, there is provided a method as defined in claim 19.

WIRELESS EARPHONE THAT TRANSITIONS BETWEEN WIRELESS NETWORKS

Inventors: Michael J. Pelland, Michael J. Koss, Michael Sagan, Steven Reckamp, Greg Hollingstad, Jeff Bovee, and Morgan Lowery

PRIORITY CLAIM

The present application claims priority to United States provisional application serial number 61/123,265, filed April 7, 2008, which is incorporated herein by reference.

BACKGROUND

Digital audio players, such as MP3 players and iPods, that store and play digital audio files, are very popular. Such devices typically comprise a data storage unit for storing and playing the digital audio, and a headphone set that connects to the data storage unit, usually with a ¼" or a 3.5 mm jack and associated cord. Often the headphones are in-ear type headphones. The cord, however, between the headphones and the data storage unit can be cumbersome and annoying to users, and the length of the cord limits the physical distance between the data storage unit and the headphones. Accordingly, some cordless headphones have been proposed, such as the Monster iFreePlay cordless headphones from Apple Inc., which include a docking port on one of the earphones that can connect directly to an iPod Shuffle. Because they have the docking port, however, the Monster iFreePlay cordless headphones from Apple are quite large and are not in-ear type phones. Recently, cordless headphones that connect wirelessly via IEEE 802.11 to a WLAN-ready laptop or personal computer (PC) have been proposed, but such headphones are also quite large and not in-ear type phones.

(8 deleted)

~~SUMMARY~~

~~In one general aspect, the present invention is directed to a wireless earphone that comprises a transceiver circuit for receiving streaming audio from a data source, such as a digital audio player or a computer, over an ad hoc wireless network.~~ When the data source and the earphone are out of range via the ad hoc wireless network, they may transition automatically to a common infrastructure wireless network (e.g., a wireless LAN). If there is no common infrastructure wireless network for both the data source and the earphone, the earphone may connect via an available infrastructure wireless network to a host server. The host server may, for example, broadcast streaming audio to the earphone and/or transmit to the earphone a network address (e.g., an Internet Protocol (IP) address) for a network-connected content server that

MewburnEllis
LLP

European Patent Attorneys
European Trade Mark Attorneys
European Design Attorneys
Chartered Patent Attorneys

33 Gutter Lane
London EC2V 8AS

Tel: +44 (0)20 7776 5300
Fax: +44 (0)20 7776 5399
mail@mewburn.com

Partners
Hugh Paget
Roger Calderbank
Patrick Stoner
Seán Walton
Nigel Hackney
Simon Kiddle
Adrian Brasnett
Roger Grimshaw
Simon Kremer
Joanna Cripps
Robert Watson
Christopher Denison
Nicholas Sutcliffe
Sofia Arenal
Matthew Naylor
Stephen Carter
Stephen Gill
Wilhelmus Wytenburg
Graham Forrest
Richard Clegg
Rachel Oxley
Rebecca Tollervey
Jeremy Webster
Richard Johnson
Hilary King
Lindsey Woolley
Simon Parry
Kerry Moroney
Sam Bailey
Graeme Moore
Stephen Hodsdon
Christopher Casley

Qualified Staff
Robert Andrews
Julie Carlisle
Michael Foster
Rachel Gee
Katherine Green
Edmund Harrison
Susan Harrison
Emily Hayes
Sheila Hill
Sean Jauss
Tanis Keirstead
Nicola Kimblin
Andy King
James Leach
Joseph Lenthall
June Lyons
Stephen Michell
Kathryn Nicholls
Frances Salisbury
Matthew Smith
Ian Stuart
Rachel White
Jonathan Wills

Consulting Partner
Ian Armitage

www.mewburn.com

European Patent Office
D-80298 München
Germany

30 November 2011

BY EPO ONLINE FILING

Dear Sirs

European Patent Application No. 09731146.8
Applicant: KOSS CORPORATION
Our Ref: SJP/FP6724736

I write in response to the official communication dated 28 June 2011 and hereby confirm the previously-filed request for substantive examination and the applicant's wish to proceed further with this application.

Additionally, I set out below our response to the objections set out in the Opinion accompanying the European Search Report.

In response to the European Search Report, I am filing herewith amended pages for this application. Clean-typed page numbers 1 and 1a of the description filed herewith are to be substituted for page 1 as presently on file whilst the attached clean-typed pages of amended claims are to be substituted for the pages of claims presently on file. For the Examiner's assistance in following the amendments incorporated into these clean-typed pages, I am also submitting herewith copies of the previous pages with the amendments shown in manuscript.

As the Examiner will note, independent claim 1 is hereby amended to address the Examiner's objection as set out in numbered paragraph 2.1 of the aforementioned Opinion. In particular, the claim now requires the transceiver circuit firmware to cause the transceiver circuit to transmit data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit "that have a signal strength above a threshold a minimum signal strength level", and no longer requires the data itself to comprise the signal strength data. Basis for this amendment arises from the passage of the description beginning at line 24 of page 12 and running over to line 6 of page 13.

We have also noted the Examiner's objections to the dependencies of the amended claims filed on entry into the European regional phase and so the Examiner will note that the amended claims filed herewith have been restored to their previous dependencies. In this regard, however, I note that the Examiner did not object to the dependency of previous claim 17 (now claim 16 in the amended set of claims filed herewith), but nevertheless for the sake of good order this claim has also now been amended so as to address the issue of its dependency.

The Examiner's comments with regard to the "doubled" claim dependencies of previous claims 14 and 15 is now moot following the above-mentioned amendments to the claims. Nevertheless, the Examiner will note that claims 16, 17 and 18 filed herewith are now each directed to "A system according to claim 10, or an earphone according to claim 1...". It is respectfully submitted that this claim structure is actually entirely clear and thus represents no contravention of Article 84 EPC. Basis for this dependency in respect of claim 16 filed herewith arises from original claim 15 of the application as filed (which was dependent upon the system of claim 14 as filed) and original claim 2 of the application as filed (which was dependent upon the earphone defined by claim 1 as originally filed). Similarly, basis for this dependency in claim 17 filed herewith arises from original claims 23 (dependent upon original system claim 14) and 5 (dependent upon original earphone claim 1) of the application as originally filed. Basis for the dependency of claim 18 filed herewith arises from original claims 24 (dependent upon independent system claim 14) and 7 (dependent upon the independent earphone of claim 6) of the application as originally filed.

Furthermore, claim 1 filed herewith has been amended so as to require receipt of the digital audio wirelessly from the data source via the ad hoc wireless network to occur "after establishing a wireless communication link with an ad hoc wireless network". Basis for this amendment, indicated as necessary by the Examiner, arises from the passage beginning at line 24 of page 12 and running on to line 6 of page 13 of the application as originally filed.

The Examiner will furthermore note that claim 1 filed herewith now refers to "a first infrastructure wireless network". This has been done to address the Examiner's lack of clarity objection with regard to claim 5, as set out in numbered paragraph 3.2 of the Search Opinion.

Furthermore, claim 1 filed herewith is now restricted to the technical features of previous claim 4, thereby making the claim clearly novel and inventive as acknowledged by the Examiner.

Claim 4 filed herewith (corresponding to previous claim 5) is also hereby amended to refer to the aforementioned "first infrastructure wireless network", in order to address the clarity objection set out in numbered paragraph 3.2 of the Search Opinion. The same amendment has been made to other claims for reasons of consistency.

Independent method claim 19 filed herewith (corresponding to previous claim 20) now specifically recites technical features corresponding to those of independent product claim 1, and is also now restricted in the same manner as claim 1 filed herewith, thereby overcoming the Examiner's clarity objection as set out in numbered paragraph 3.3 of the Opinion.

Both the independent claims are now cast into the two part form with respect to prior art document D1, and prior art document D1 has been briefly identified on the first page of the description. In this regard, I note that in numbered paragraph 7.3 of the Search Opinion the Examiner suggested that prior art documents "D1-D4" should be identified in the description. However, it seems that only three prior art documents were actually cited in the official search report and of those only document D1 was cited as a document having any direct relevance to the invention defined by the claims in this application. It is therefore deemed appropriate only to identify prior art document D1 in this manner.

It is respectfully submitted that the amendments filed herewith now place the application in order for acceptance and we therefore look forward to receiving an official communication under Rule 71(3) EPC in due course.

As a precaution against premature refusal, oral proceedings under A.116 EPC are requested in the event that the EPO forms an intention to refuse the application, but for compliance with A.113(1) EPC it is requested that before any summons to oral proceedings is issued the applicant is given, in accordance with A.94(3) EPC, a proper opportunity to reply in writing to any objection raised by the EPO, especially any objection based on prior art not previously referred to in the examination.

We also reserve the right to file divisional applications for any subject matter in the original application.

Yours faithfully

Simon James Parry
AUTHORISED REPRESENTATIVE
MEWBURN ELLIS LLP
simon.parry@mewburn.com
Tel: +44 161 247 7722

Enc. Replacement claims 1 to 21 (replacement pages 22 to 25)
Replacement page 1
New page 1a
Marked-up amendments

SJP/bmb

Europäisches Patentamt
European Patent Office
Office européen des brevets

Letter accompanying subsequently filed items

Sender:

Mr Simon PARRY
Mewburn Ellis LLP
33 Gutter Lane
London Greater London EC2V 8AS
United Kingdom

Phone: +44 20 7776 5300
Fax: +44 20 7776 5399
E-mail: mail@mewburn.com

80298 Munich
Germany
Tel. +49(0)89 2399-0 | Fax -4465

P.O. Box 5818
NL-2280 HV Rijswijk
Netherlands
Tel. +31(0)70 340-2040 | Fax -3016

10958 Berlin
Germany
Tel. +49(0)30 25901-0 | Fax -840

The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	09731146.8
Applicant's or representative's reference	SJP/FP6724736

	Description of document	Original file name	Assigned file name
1	Reply to search opinion/written opinion/IPER	#10078388-v1-To_EPO_-_30_11_2011_-_response.PDF	WOREPLY-1.PDF
2	Amended description (clean copy)	#10080127-v1-To_EPO_-_30_11_2011_-_replacement_pages.PDF	DESC-1.PDF
3	Amended claims (clean copy)	10080295-v1-To_EPO_-_30_11_2011_-_replacement_claims.PDF	CLMS-1.PDF
4	Amended description with annotations	#10080373-v1-To_EPO_-_30_11_2011_-_description (manuscript) .PDF	DESC-HWA-1.PDF
5	Amended claims with annotations	#10074291-v1-To_EPO_-_30_11_2011_-_claims_(manuscript).PDF	CLMS-HWA-1.PDF

Signatures

Place:

Date: **30 November 2011**

Signed by: **GB, Mewburn Ellis LLP, S. Parry 20806**

Capacity: **(Representative)**

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY
Tel. +49 (0)89 2399 - 0
Fax +49 (0)89 2399 - 4465

For any questions about this communication:
Tel.:+31 (0)70 340 45 00

Parry, Simon James
Mewburn Ellis LLP
33 Gutter Lane
London
EC2V 8AS
ROYAUME UNI

Date
28.06.11

Reference	Application No./Patent No.
SJP/FP6724736	09731146.8 - 2225 / 2272259 PCT/US2009039754
Applicant/Proprietor	
Koss Corporation	

Communication pursuant to Rules 70(2) and 70a(2) EPC

A supplementary European search report has been drawn up concerning the above-identified European patent application (publication number: 2272259).

Since the request for examination has been filed (R. 70(1), 159(1)(f), Art. 94(1) EPC) prior to the transmission of the supplementary European search report, you are hereby invited to indicate within

six months

of notification of this communication whether you wish to proceed further with the European patent application.

If you do not indicate in due time that you wish to proceed further with the European patent application, it **will be deemed to be withdrawn** (R. 70(3) EPC).

You are invited to correct any deficiencies noted in the opinion accompanying the European search report and to amend the description, claims and drawings within the above period (R. 70a(2), R. 137(2) EPC).

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

Should the reply to the invitation pursuant to Rule 70a(2) EPC be filed in an admissible non-EPO language, a translation is to be submitted within one month of its filing (R. 6(2) EPC).

Should you not comply with or comment on this invitation within the time limit, the application **will be deemed to be withdrawn** in accordance with Rule 70a(3) EPC.

Receiving Section

Europäisches Patentamt • European Patent Office • Office européen des brevets

Registered letter
EPO Form 1224 04.10 (RTB/ESOP01=N) DMEX

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
80298 MUNICH
GERMANY
Tel. +49 (0)89 2399 - 0
Fax +49 (0)89 2399 - 4465

For any questions about this communication:
Tel.:+31 (0)70 340 45 00

Parry, Simon James
Mewburn Ellis LLP
33 Gutter Lane
London
EC2V 8AS
ROYAUME UNI

Date
10.06.11

Reference	Application No./Patent No.
SJP/FP6724736	09731146.8 - 2225 / 2272259 PCT/US2009039754
Applicant/Proprietor	
Koss Corporation	

Communication

The extended European search report is enclosed.

The extended European search report includes, pursuant to Rule 62 EPC, the supplementary European search report (Art. 153(7) EPC) and the European search opinion.

Copies of documents cited in the European search report are attached.

☑ 0 additional set(s) of copies of such documents is (are) enclosed as well.

Refund of the search fee

If applicable under Article 9 Rules relating to fees, a separate communication from the Receiving Section on the refund of the search fee will be sent later.

The examination is being carried out on the **following application documents**

Description, Pages

1-21 as published

Claims, Numbers

1-23 filed with entry into the regional phase before the EPO

Drawings, Sheets

1/16-16/16 as published

1 Reference is made to the following documents; the numbering will be adhered to in the rest of the procedure.

US 2007/165875 A1 (REZVANI BEHROOZ [US] ET AL) 19 July 2007 (2007-07-19)

WO 2007/139578 A1 (SONY ERICSSON MOBILE COMM AB [SE]; BLOEBAUM L SCOTT [US]; LIU CHARLES) 6 December 2007 (2007-12-06)

US 2007/049198 A1 (WALSH SCOTT [GB] ET AL) 1 March 2007 (2007-03-01)

Unallowable amendments, Article 123(2) EPC:

2 Claims 1-23 filed with the entry into the regional phase before the EPO introduces subject-matter which extends beyond the content of the application as originally filed, contrary to Article 123(2) EPC.

2.1 In claim 1, the data transmitted to the data source regarding the one or more detected infrastructure wireless network comprises **identification data** and **signal strength**. The corresponding originally filled description, see Pag. 12 Line 24 - Pag. 13 Line 6, appears indeed to teach that is transmitted **identification data** (ID) of the infrastructure wireless network, Pag. 12 Line 34. However no information regarding the **signal strength** is transmitted but only locally evaluated at the earphone side or at the data source side.

2.2 The dependencies of the claims filed with the entry into the regional phase before the EPO were dramatically changed with respect to the originally filed claims and the examiner did not find that the newly combination so achieved was disclosed into the originally filed application. Therefore the Applicant is requested to revert to the original dependencies, or if considers to maintain some of them in believing that the

newly achieved combination can be unambiguously derived from the originally filed application documents, if any, than is invited to file explanation in supporting any of the modified dependencies.

Some of the modified dependencies:

- claims 4, 5, 6, 11 were originally dependent only n claim 1,

- claims 7, 8 were originally dependent only on claim 6,

- claims 13, 14, 15 were originally dependent only on claim 12,

- claim 16 was originally dependent only on claim 13,

- claims 18, 19 were originally dependent only on claim 11.

2.3 As with respect to claims 14 and 15, beyond the fact that their dependencies were dramatically changed, now any of them is a "doubled" claim referring either to a system or to an earphone, thus giving rise to a clarity objection, Article 84 EPC.

Lack of Clarity, Article 84 EPC:

3 The application does not meet the requirements of Article 84 EPC, because claims 1-23 are not clear.

3.1 The earphone of claim 1 appears to receive digital audio data from the data source via an ad hod wireless network without to establish in advance such a network, e.g. to "establish an ad hoc wireless network". For clarity such an extra feature should be added in claim 1.

Similarly, data regarding the infrastructure wireless network is transmitted to the data source without explicitly defining that such an existing infrastructure network is detected in advance, e.g. "detect existing infrastructure wireless networks".

3.2 The "pre-set infrastructure wireless network" of claim 5 was not defied in any of the preceding claims prior to be used.

This said "pre-set infrastructure wireless network" appears rather to refer to the said "infrastructure wireless network" of claim 1.

3.3 Independent method claim 20 should clearly correspond to the independent apparatus claim 1. Following the requirement of Article 84 EPC, taken in combination with Rule 43(1) and (3) EPC, any independent claim must contain all the technical features essential to the definition of the invention.

In the present case, since independent method claim 20 is not fully corresponding to the independent apparatus claim 1, is not clear which are those features which are considered to be essential for the definition of the invention, Article 84 EPC.

Lack of Novelty of the Independent Claims, Article 54 (1) and (2) EPC:

4 Document D1 discloses (Fig. 1,2,8,10; Par. 19, 33, 41) a headset which may be connected to a mobile phone or directly to the wi-fi access point or equivalent. The mobile phone (Fig. 8 Ref. 840) is the equivalent of a data source in the sense of claim 1. The data source may transmit audio data to the headset (see e.g. Par 33). Such audio data may be locally stored into the mobile phone, as widely known, or retransmitted from some any other entity.

Essentially, the headset of document D1 is designed to perform a **handoff** between the mobile phone connection and a wi-fi connection or the equivalent. Such a handoff is advantageously performed when the connectivity to one of the peers is becoming weak (e.g. the ad hoc connection with the mobile phone) but not only, the person skilled in the art is well aware of the need or the benefits of the handoffs. When such a handoff is performed, information (e.g. including the ID) regarding a possible used network is exchanged with the communication peer for performing the handoff.

Therefore, the subject-matter of independent apparatus claim 1 and of the corresponding independent method claim 20 is essentially covered by the system of D1 and therefore is considered not new, Article 54 (1) and (2) EPC.

Dependent Claims:

5 Dependent claims 2,3,6-19, 21-23 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the EPC in respect of novelty (claims 2, 3, 6-8, 10-15, 17, 18) or inventive step (claims 9, 16, 19, 21-23). The additional features of the dependent claims are either disclosed in the cited documents D1-D3 or represent straightforward design options when designing corresponding wireless devices.

Positive Opinion:

6 The system of D1 comprises the feature of performing a handoff between an ad hoc wireless connection with a mobile phone and an infrastructure wireless network. Data may be transferred to the earphone either from the mobile phone or from the infrastructure wireless network, e.g. when a handoff is performed during a data transfer via the mobile phone from another data source placed somewhere in the WEB. However, D1 does not teach that the audio data from the data source, i.e. the mobile phone, is redirected to the headphone via the infrastructure wireless network when the ad hoc network connection is lost, i.e. when the connection with the mobile phone is lost.

Therefore the subject-matter of claim 4 appears to be new when the above objections are remedied.

Also the subject-matter of claim 5 appears might be new, provided that the earphone is connected **automatically** (see also Pag. 12 Lines 18-21) to a host server via a second infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and the data source and the earphone are not in wireless communication via said the pre-set infrastructure wireless network.

Is to be mentioned that the apparatus of D1 is designed such that, under the (inter) action of a user, the earphone may be connected to a host server via another available infrastructure wireless network when the other two connections are broken. However, the fact that the earphone **automatically** connect to such a host server in such a case, appears not to be disclosed or suggested in the prior art.

Further aspects:

7.1 When filing amendments, the applicant should clearly identify the amendments made, irrespective of whether they concern amendments by addition, replacement or deletion, and indicate the passages of the application as filed on which these amendments are based (see Guidelines E-II, 1). Care should be taken, not to add subject-matter which extends beyond the content of the application as originally filed (Article 123 (2) EPC).

The applicant should at the same time bring the description into conformity with the amended claims.

7.2 Independent claims are not in the two-part form in accordance with Rule 43(1) EPC, which in the present case would be appropriate, with those features known in combination from the prior art being placed in the preamble (Rule 43(1)(a) EPC) and the remaining features being included in the characterising part (Rule 43(1)(b) EPC).

7.3 To meet the requirements of Rule 42(1)(b) EPC, D1-D4 should be identified in the description and the relevant background art disclosed therein should be briefly discussed.

Europäisches Patentamt
European Patent Office
Office européen des brevets

SUPPLEMENTARY EUROPEAN SEARCH REPORT

Application Number
EP 09 73 1146

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2007/165875 A1 (REZVANI BEHROOZ [US] ET AL) 19 July 2007 (2007-07-19) * figures 1,2,8,10 * * paragraphs [0019], [0033], [0041] *	1-3,6-23	INV. H04R1/02
A	WO 2007/139578 A1 (SONY ERICSSON MOBILE COMM AB [SE]; BLOEBAUM L SCOTT [US]; LIU CHARLES) 6 December 2007 (2007-12-06) * figure 3 * * page 7, line 28 - page 9, line 3 *	1-23	
A	US 2007/049198 A1 (WALSH SCOTT [GB] ET AL) 1 March 2007 (2007-03-01) * figure 1 * * paragraph [0016] - paragraph [0018] *	1-23	

TECHNICAL FIELDS SEARCHED (IPC)

H04M

The supplementary search report has been based on the last set of claims valid and available at the start of the search.

Place of search	Date of completion of the search	Examiner
Munich	31 May 2011	Moscu, Viorel

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

1

EPO FORM 1503 03.82 (P04C04)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 73 1146

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

31-05-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007165875 A1	19-07-2007	NONE	
WO 2007139578 A1	06-12-2007	CN 101449561 A	03-06-2009
		EP 2030417 A1	04-03-2009
		JP 2009538087 T	29-10-2009
		US 2007283033 A1	06-12-2007
US 2007049198 A1	01-03-2007	WO 2007027270 A1	08-03-2007

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
Postbus 5818
2280 HV RIJSWIJK
NETHERLANDS
Tel. +31 (0)70 340-2040
Fax +31 (0)70 340-3016

For any questions about this communication:
Tel.:+31 (0)70 340 45 00

Parry, Simon James
Mewburn Ellis LLP
33 Gutter Lane
London
EC2V 8AS
GRANDE BRETAGNE

Date
15.12.10

Reference	Application No./Patent No.
SJP/FP6724736	09731146.8 - 1224 / 2272259 PCT/US2009039754
Applicant/Proprietor	
Koss Corporation	

Communication of European publication number and information on the application of Article 67(3) EPC

The provisional protection under Article 67(1) and (2) EPC in the individual Contracting States becomes effective only when the conditions referred to in Article 67(3) EPC have been fulfilled (for further details, see information brochure of the European Patent Office "National Law relating to the EPC" and additional information in the Official Journal of the European Patent Office).

Pursuant to Article 153(3) EPC the publication under Article 21 PCT of an international application for which the European Patent Office is a designated or elected Office takes the place of the publication of a European patent application.

The bibliographic data of the above-mentioned Euro-PCT application will be published on 12.01.11 in Section I.1 of the European Patent Bulletin. The European publication number is 2272259.

In all future communications to the European Patent Office, please quote the application number plus Directorate number.

Receiving Section

Europäisches Patentamt
European Patent Office
Office européen des brevets

Letter accompanying subsequently filed items

Sender:

Mr Graeme MOORE
Mewburn Ellis LLP
33 Gutter Lane
London Greater London EC2V 8AS
United Kingdom

Phone: +44 20 7776 5300
Fax: +44 20 7776 5399
E-mail: mail@mewburn.com

80298 Munich
Germany
Tel. +49(0)89 2399-0 | Fax -4465

P.O. Box 5818
NL-2280 HV Rijswijk
Netherlands
Tel. +31(0)70 340-2040 | Fax -3016

10958 Berlin
Germany
Tel. +49(0)30 25901-0 | Fax -840

The document(s) listed below is (are) subsequently filed documents pertaining to the following application:

Application number	09731146.8
Applicant's or representative's reference	SJP/FP6724736

	Description of document	Original file name	Assigned file name
1	Reply to search opinion/written opinion/IPER	9224410-v1-to_IPO_3_Dec_2010_-_PPH_request.PDF	WOREPLY-1.PDF
2	Reply to search opinion/written opinion/IPER	9179430-v1-IPER_pdf.PDF	WOREPLY-2.PDF
3	Claims	9224548-v1-Claims.PDF	CLMS-1.PDF
4	Reply to search opinion/written opinion/IPER	EFSLIVE-#9194020-v1-PPH_request_form_1009.pdf	WOREPLY-3.pdf

Signatures

Place:
Date: **03 December 2010**
Signed by: **GB, Mewburn Ellis LLP, S. Parry 20806**
Capacity: **(Representative)**

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 080188PCT	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US09/39754	International filing date *(day/month/year)* 07 April 2009 (07.04.2009)	Priority date *(day/month/year)* 07 April 2008 (07.04.2008)
International Patent Classification (IPC) or national classification and IPC IPC: **H04R 1/02**(2006.01) USPC: 455/3.06,575.1		
Applicant KOSS CORPORATION		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of ___ sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of report with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
03 December 2009 (03.12.2009)	21 October 2010 (21.10.2010)
Name and mailing address of the IPEA/US Mail Stop PCT, Attn: IPEA/ US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No.	Authorized officer Charles Appiah Telephone No. 571-273-8300

Form PCT/IPEA/409 (cover sheet)(July 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US09/39754

I. Basis of the report

1. With regard to the **elements** of the international application:*

☒ the international application as originally filed.

☐ the description:
pages 22-28 as originally filed
pages None, filed with the demand
pages None, filed with the letter of _____.

☒ the claims:
pages 1-33, as originally filed
pages None, as amended (together with any statement) under Article 19
pages None, filed with the demand
pages None, filed with the letter of _____.

☒ the drawings:
pages 1-16, as originally filed
pages None, filed with the demand
pages Nobe, filed with the letter of _____.

☒ the sequence listing part of the description:
pages None, as originally filed
pages None, filed with the demand
pages None, filed with the letter of _____.

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination(under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/~~fig~~ _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*
** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

Form PCT/IPEA/409 (Box I) (July 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US09/39754

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. STATEMENT

Novelty (N)	Claims 1-33	YES
	Claims NONE	NO
Inventive Step (IS)	Claims 1-33	YES
	Claims NONE	NO
Industrial Applicability (IA)	Claims 1-33	YES
	Claims NONE	NO

2. CITATIONS AND EXPLANATIONS
Please See Continuation Sheet

Form PCT/IPEA/409 (Box V) (July 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US09/39754

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Claims 1-33 meet novelty under PCT Article 33(2) .

Claim 1 An earphone comprising:
a body, wherein the body comprises:
at least one acoustic transducer for converting an analog electrical signal to sound; an antenna; and a transceiver circuit in communication with the at least one acoustic transducer and the
antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals
via the antenna, and wherein the transceiver circuit is for out-putting the analog electrical
signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit
comprises firmware, which when executed by the transceiver circuit, causes the
transceiver circuit to:
receive digital audio wirelessly from a data source via an ad hoe wireless network when the data source is in wireless communication range with the earphone via the ad hoc wireless network;
transmit data via the ad hoe wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoe wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks; and
when the data source is not in wireless communication range with the earphone via the ad hoe wireless network, transition automatically to receive digital audio via an infrastructure wireless network.

2. The earphone of claim 1, wherein the data source comprises a digital audio player. 3. The earphone of claim 1, wherein the transceiver circuit comprises: a wireless communication module; a processor unit in commaunication with the wireless communication module; a non-volatile memory unit in communication with the processor unit; and a volatile memory unit in communication with the processor unit.

4 The earphone of claim 3, wherein the wireless communication module comprises a Wi-Fi communication module.
5.The earphone of claim 1, wherein the infrastructure wireless network comprises a WLAN.

6 The earphone of claim 1, wherein the transceiver ch'cuit is for receiving digital audio from the data source via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoe wireless network.

7. The earphone of claim 6, wherein the infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoe wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.

8.The earphone of claim 1, wherein the ftrmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoe wireless network and (2) the data source and the earphone are not in wireless communication via the pre-set infrastructure wireless network.

9.The earphone of claim 1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoe wireless network.
10. The earphone of claim 9, wherein the earphone is for receiving streaming digital audio from the host server via the infrastructure wireless network.
11. The earphone of claim 9, wherein the earphone is for receiving a ftrst network address for a first streaming digital audio content server from the host server via the infrastructure wireless network.

12. The earphone of claim 11, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

13. The earphone of claim 12, wherein the user control comprises a button.

Form PCT/IPEA/409 (Continuation Sheet) (July 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US09/39754

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

14. A system comprising: a data source for wirelessly transmitting streaming digital audio; and a wireless earphone that comprises: at least one acoustic transducer for converting an analog electrical signal to sound; an antenna; and a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:
receive the streaming digital audio wirelessly from the data source via an ad hoe wireless network when the data source is in wireless communication range with the earphone via the ad hoe wireless network;
transmit data via the ad hoe wireless network to the data source regarding one or more irastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastruc~re wireless networks; and
when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive streaming digital audio via an infrastructure wireless network.

15. The system of claim 14, wherein the data source comprises a digital audio player.

16. The system of claim 14, further comprising a host server that is in communication with the wireless earphone via the infrastructure wireless network.

17. The system of claim 16, wherein the firmware of the transceiver circuit of the wireless earphone, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to the host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

18. The system of claim 16, wherein the host server is for streaming digital audio to the earphone via the infrastructure wireless network.

19. The system of claim 16, wherein the host server is for transmitting a ftrst network address for a fLrst streaming digital audio content server to the earphone via the in~astructure wireless network.

20. The system of claim 19, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

21. The earphone of claim 20, wherein the user control comprises a button.

22. The system of claim 17, further comprising a web page for the wireless earphone through which a user is capable of configuring one or more settings for the wireless earphone.

23. The system of claim 14, wherein the infrastruc~tre wireless network comprises a WLAN. 24. The system of claim 14, wherein the ftrmware, when executed by the infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoe wireless network and when the pre-set infrastructure wireless network is in range, of both the earphone and the data source.

25. The system of claim 14, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoe wireless network and (2) the data source and the earphone are not in wireless communication via the pre-set infrastructure wireless network.

26. The system of claim 25, wherein the host server is for streaming digital audio to the earphone via the infrastructure wireless network.

27. The system of claim 25, wherein the host sever is for transmitting a first network address fora first streaming digital audio content server to the earphone via the infrastructure wireless network.

28. The system of claim 27, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US09/39754

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

29. The earphone of claim 28, wherein the user control comprises a button. 30. A method comprising: receiving, by a wireless earphone, via an ad hoe wireless network, digital audio from a data
source when the data source is in wireless communication with the earphone via the ad hoe wireless network;
transmitting data via the ad hoe wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoe wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks; converting, by the wireless earphone, the digital audio to sound; and when the data source is not in wireless communication with the earphone, transitioning automatically, by the earphone, to receive digital audio via an infrastructure wireless network.

31. The method of claim 30, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises transitioning automatically to receive digital audio from the data source via an infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoe wireless network.

32. The method of claim 30, wherein transitioning automatically by the earphone to receive digital audio via an irffxastructure wireless network comprises transitioning automatically to receive digital audio from a host sever via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoe wireless network

33. The method of claim 30, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises: receiving, by the wireless earphone via the infastructure wireless network, from a host server
connected to the infrastructure wireless network, a network address for a streaming digital audio content server; and
connecting, by the wireless earphone, to the streaming digital audio content server using the
network address received from the host server.

V. 2. Citations and Explanations:

REPLACEMENT SHEET

CLAIMS

What is claimed is:

1. An earphone comprising:

a body, wherein the body comprises:

at least one acoustic transducer for converting an analog electrical signal to sound;

an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:

receive digital audio wirelessly from a data source via an ad hoc wireless network when the data source is in wireless communication range with the earphone via the ad hoc wireless network;

transmit data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks; and

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive digital audio via an infrastructure wireless network.

REPLACEMENT SHEET

2. The earphone of claim 1, wherein the data source comprises a digital audio player.

3. The earphone of claim 1, wherein the transceiver circuit comprises:

a wireless communication module;

a processor unit in communication with the wireless communication module;

a non-volatile memory unit in communication with the processor unit; and

a volatile memory unit in communication with the processor unit.

4. The earphone of claim 3, wherein the wireless communication module comprises a Wi-Fi communication module.

5. The earphone of claim 1, wherein the infrastructure wireless network comprises a WLAN.

6. The earphone of claim 1, wherein the transceiver circuit is for receiving digital audio from the data source via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

7. The earphone of claim 6, wherein the infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.

8. The earphone of claim 1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication via the pre-set infrastructure wireless network.

REPLACEMENT SHEET

9. The earphone of claim 1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

10. The earphone of claim 9, wherein the earphone is for receiving streaming digital audio from the host server via the infrastructure wireless network.

11. The earphone of claim 9, wherein the earphone is for receiving a first network address for a first streaming digital audio content server from the host server via the infrastructure wireless network.

12. The earphone of claim 11, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

13. The earphone of claim 12, wherein the user control comprises a button.

14. A system comprising:

a data source for wirelessly transmitting streaming digital audio; and

a wireless earphone that comprises:

at least one acoustic transducer for converting an analog electrical signal to sound;

an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit

REPLACEMENT SHEET

comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:

receive the streaming digital audio wirelessly from the data source via an ad hoc wireless network when the data source is in wireless communication range with the earphone via the ad hoc wireless network;

transmit data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks; and

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive streaming digital audio via an infrastructure wireless network.

15. The system of claim 14, wherein the data source comprises a digital audio player.

16. The system of claim 14, further comprising a host server that is in communication with the wireless earphone via the infrastructure wireless network.

17. The system of claim 16, wherein the firmware of the transceiver circuit of the wireless earphone, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to the host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

18. The system of claim 16, wherein the host server is for streaming digital audio to the earphone via the infrastructure wireless network.

REPLACEMENT SHEET

19. The system of claim 16, wherein the host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the infrastructure wireless network

20. The system of claim 19, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

21. The earphone of claim 20, wherein the user control comprises a button.

22. The system of claim 17, further comprising a web page for the wireless earphone through which a user is capable of configuring one or more settings for the wireless earphone.

23. The system of claim 14, wherein the infrastructure wireless network comprises a WLAN.

24. The system of claim 14, wherein the firmware, when executed by the infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.

25. The system of claim 14, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication via the pre-set infrastructure wireless network.

26. The system of claim 25, wherein the host server is for streaming digital audio to the earphone via the infrastructure wireless network.

REPLACEMENT SHEET

27. The system of claim 25, wherein the host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the infrastructure wireless network

28. The system of claim 27, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

29. The earphone of claim 28, wherein the user control comprises a button.

30. A method comprising:

receiving, by a wireless earphone, via an ad hoc wireless network, digital audio from a data source when the data source is in wireless communication with the earphone via the ad hoc wireless network;

transmitting data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks;

converting, by the wireless earphone, the digital audio to sound; and

when the data source is not in wireless communication with the earphone, transitioning automatically, by the earphone, to receive digital audio via an infrastructure wireless network.

31. The method of claim 30, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises transitioning automatically to

REPLACEMENT SHEET

receive digital audio from the data source via an infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

32. The method of claim 30, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises transitioning automatically to receive digital audio from a host sever via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network

33. The method of claim 30, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises:

receiving, by the wireless earphone via the infrastructure wireless network, from a host server connected to the infrastructure wireless network, a network address for a streaming digital audio content server; and

connecting, by the wireless earphone, to the streaming digital audio content server using the network address received from the host server.

ANNOTATED SHEET SHOWING CHANGES

CLAIMS

What is claimed is:

1. An earphone comprising:

a body, wherein the body comprises:

at least one acoustic transducer for converting an analog electrical signal to sound;

an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:

receive digital audio wirelessly from a data source via an ad hoc wireless network when the data source is in wireless communication range with the earphone via the ad hoc wireless network;

transmit data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks; and

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive digital audio via an infrastructure wireless network.

2. The earphone of claim 1, wherein the data source comprises a digital audio player.

3. The earphone of claim 1, wherein the transceiver circuit comprises:

a wireless communication module;

a processor unit in communication with the wireless communication module;

a non-volatile memory unit in communication with the processor unit; and

a volatile memory unit in communication with the processor unit.

4. The earphone of claim 3, wherein the wireless communication module comprises a Wi-Fi communication module.

ANNOTATED SHEET SHOWING CHANGES

5. The earphone of claim 1, wherein the infrastructure wireless network comprises a WLAN.

6. The earphone of claim 1, wherein the transceiver circuit is for receiving digital audio from the data source via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

7. The earphone of claim 6, wherein the infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.

~~8~~8. The earphone of claim ~~7~~1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to ~~transmit data via the ad hoc wireless network to the data source regarding one or more~~connect to a host server via a second infrastructure wireless ~~networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc~~network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication via the pre-set infrastructure wireless network.

9. ~~The earphone of claim 8, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication via the pre-set infrastructure wireless network.~~10. The earphone of claim 1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

10. The earphone of claim 9, wherein the earphone is for receiving streaming digital audio from the host server via the infrastructure wireless network.

11. The earphone of claim ~~10~~9, wherein the earphone is for receiving a first network address for a first streaming digital audio content server from the host server via the infrastructure wireless network.

ANNOTATED SHEET SHOWING CHANGES

12. The earphone of claim ~~10,~~11, wherein the earphone ~~is for receiving a first~~comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a ~~first~~second streaming digital audio content server ~~from the host server via the infrastructure wireless network~~.

13. The earphone of claim 12, wherein the ~~earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server~~user control comprises a button.

14. ~~The earphone of claim 13, wherein the user control comprises a button.~~15. A system comprising:

a data source for wirelessly transmitting streaming digital audio; and

a wireless earphone that comprises:

at least one acoustic transducer for converting an analog electrical signal to sound;

an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:

receive the streaming digital audio wirelessly from the data source via an ad hoc wireless network when the data source is in wireless communication range with the earphone via the ad hoc wireless network;

transmit data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks; and

ANNOTATED SHEET SHOWING CHANGES

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive streaming digital audio via an infrastructure wireless network.

15. The system of claim 14, wherein the data source comprises a digital audio player.

16. The system of claim ~~15, wherein the data source comprises a digital audio player~~14, further comprising a host server that is in communication with the wireless earphone via the infrastructure wireless network.

17. The system of claim ~~15, further comprising a host server that is~~16, wherein the firmware of the transceiver circuit of the wireless earphone, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to the host server via the infrastructure wireless network when the data source is not in wireless communication range with the ~~wireless~~ earphone via the ~~infrastructure~~ad hoc wireless network.

18. The system of claim ~~17, wherein the firmware of the transceiver circuit of the wireless earphone, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to~~16, wherein the host server is for streaming digital audio to the earphone via the infrastructure ~~wireless network when the data source is not in wireless communication range with the earphone via the ad hoc~~ wireless network.

19. The system of claim ~~17,~~16, wherein the host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the infrastructure wireless network~~.~~

20. The system of claim ~~17, wherein~~19, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server ~~is~~ for ~~transmitting a first~~a second network address for a ~~first~~second streaming digital audio content server ~~to the earphone via the infrastructure wireless network~~.

21. The ~~system~~earphone of claim 20, wherein the ~~earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server~~user control comprises a button.

ANNOTATED SHEET SHOWING CHANGES

22. The ~~earphone of claim 21, wherein the user control comprises a button~~system of claim 17, further comprising a web page for the wireless earphone through which a user is capable of configuring one or more settings for the wireless earphone.

23. The system of claim ~~18, wherein the host server hosts a web page for the wireless earphone through which a user is capable of configuring one or more settings for the wireless earphone~~14, wherein the infrastructure wireless network comprises a WLAN.

24. The system of claim ~~15,~~14, wherein the firmware, when executed by the infrastructure wireless network ~~comprises~~is a ~~WLAN.25. The system of claim 15, wherein the firmware, when executed by the infrastructure wireless network is a~~ pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.

25. The system of claim 14, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and ~~when~~(2) the data source and the earphone are not in wireless communication via the pre-set infrastructure wireless network ~~is in range of both the earphone and the data source~~.

26. The system of claim 25, wherein the ~~firmware, when executed by the transceiver circuit, causes the transceiver circuit of~~host server is for streaming digital audio to the earphone ~~to transmit data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc~~via the infrastructure wireless network.

27. The system of claim ~~26,~~25, wherein the ~~firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication~~host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the ~~pre-set~~ infrastructure wireless network.

ANNOTATED SHEET SHOWING CHANGES

28. The system of claim 27, wherein the ~~host server is for streaming digital audio to~~earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

29. The ~~system of claim 27, wherein the host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the infrastructure wireless network~~

~~30. The system of claim 29, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.31. The earphone of claim 30,~~earphone of claim 28, wherein the user control comprises a button.

~~32. A system comprising:~~

~~a host server;~~

~~a first streaming digital audio content server that is connected to the host server via a data network; and~~

~~a wireless earphone that is in communication with the host server via a wireless network, wherein the host server is programmed to transmit to the earphone a first network address for the first streaming digital audio content server.~~

~~33. The system of claim 32, wherein the wireless earphone comprises:~~

~~at least one acoustic transducer for converting an analog electrical signal to sound;~~

~~an antenna; and~~

~~a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware that is executed by the transceiver circuit.~~

~~34. The system of claim 33, wherein the host server hosts a web page for the wireless earphone through which a user is capable of configuring one or more settings for the wireless earphone.~~

~~35. The system of claim 34, wherein the one or more settings comprise the first streaming digital audio content server and a second streaming digital audio content server.~~

ANNOTATED SHEET SHOWING CHANGES

~~36. The system of claim 35, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the wireless network to the host server for a second network address for the second streaming digital audio content server.~~

~~37. A headset comprising:~~

~~a first earphone that comprises one or more acoustic transducers for converting a first analog electrical signal to sound; and~~

~~a second earphone, connected to the first earphone, wherein the second earphone comprises one or more acoustic transducers for converting a second analog electrical signal to sound, and wherein the first earphone comprises:~~

~~a first antenna; and~~

~~a first transceiver circuit in communication with the one or more acoustic transducers of the first earphone and in communication with the first antenna, wherein the first transceiver circuit is for receiving and transmitting wireless signals via the first antenna, and wherein the first transceiver circuit is for outputting the first analog electrical signal to the one or more acoustic transducers of the first earphone, and wherein the first transceiver circuit comprises firmware, which when executed by the first transceiver circuit, causes the first transceiver circuit to:~~

~~receive digital audio wirelessly from a data source via an ad hoc wireless network when the data source is in wireless communication range with the first earphone via the ad hoc wireless network; and~~

~~when the data source is not in wireless communication range with the first earphone via the ad hoc wireless network, transition automatically to receive digital audio via an infrastructure wireless network.~~

~~38. The headset of claim 37, further comprising a head band, wherein the first and second earphones are connected to the headband.~~

~~39. The headset of claim 37, further comprising a microphone having an output connected to the first transceiver circuit.~~

~~40. The headset of claim 37, wherein the first transceiver circuit is for outputting the second analog electrical signal to the one or more acoustic transducers of the second earphone.~~

~~41. The headset of claim 37, wherein the second earphone comprises:~~

~~a second antenna; and~~

ANNOTATED SHEET SHOWING CHANGES

~~a second transceiver circuit in communication with the one or more acoustic transducers of the second earphone and in communication with the second antenna, wherein the second transceiver circuit is for receiving and transmitting wireless signals via the second antenna, and wherein the second transceiver circuit is for outputting the second analog electrical signal to the one or more acoustic transducers of the second earphone, and wherein the second transceiver circuit comprises firmware, which when executed by the second transceiver circuit, causes the second transceiver circuit to:~~

~~receive digital audio wirelessly from the data source via the ad hoc wireless network when the data source is in wireless communication range with the second earphone via the ad hoc wireless network; and~~

~~when the data source is not in wireless communication range with the second earphone via the ad hoc wireless network, transition automatically to receive digital audio via the infrastructure wireless network.~~

~~42. The headset of claim 37, wherein the first earphone comprises a first data port and the second earphone comprises a second data port, and wherein the headset further comprises an adapter connected to the first data port of the first earphone and to the second data port of the second earphone, and wherein the adapter comprises an output plug connector for connecting to a remote device.~~

~~43.~~30. A method comprising:

receiving, by a wireless earphone, via an ad hoc wireless network, digital audio from a data source when the data source is in wireless communication with the earphone via the ad hoc wireless network;

transmitting data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks;

converting, by the wireless earphone, the digital audio to sound; and

when the data source is not in wireless communication with the earphone, transitioning automatically, by the earphone, to receive digital audio via an infrastructure wireless network.

ANNOTATED SHEET SHOWING CHANGES

~~44.~~31. The method of claim ~~43,~~30, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises transitioning automatically to receive digital audio from the data source via an infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

~~45. The method of claim 43, further comprising, receiving by the wireless earphone from the data source via the ad hoc wireless network data regarding one or more infrastructure wireless networks detected by data source when the earphone and the data source are communicating via the ad hoc wireless network.~~

~~46.~~32. The method of claim ~~43,~~30, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises transitioning automatically to receive digital audio from a host sever via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network

~~47.~~33. The method of claim ~~43,~~30, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises:

receiving, by the wireless earphone via the infrastructure wireless network, from a host server connected to the infrastructure wireless network, a network address for a streaming digital audio content server; and

connecting, by the wireless earphone, to the streaming digital audio content server using the network address received from the host server.

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
Postbus 5818
2280 HV RIJSWIJK
NETHERLANDS
Tel. +31 (0)70 340-2040
Fax +31 (0)70 340-3016

For any questions about this communication:
Tel.:+31 (0)70 340 45 00

Parry, Simon James
Mewburn Ellis LLP
33 Gutter Lane
London
EC2V 8AS
GRANDE BRETAGNE

Date: 23-11-2010

Reference	Application No./Patent No.
SJP/FP6724736	09731146.8 - 1224 PCT/US2009039754
Applicant/Proprietor: Koss Corporation	

Communication pursuant to Rules 161(2) and 162 EPC

1. Amendment of the application (R. 161(2) EPC)

The above-mentioned international (Euro-PCT) application has entered the European phase.

Under Articles 28, 41 PCT and Rules 52, 78 PCT the application may be amended before a designated or elected Office.

In accordance with Rule 161(2) EPC, you may amend your application once within a **non-extendable period of one month** after notification of the present communication.

If filing amendments, you must identify them and indicate the basis for them in the application as filed. Failure to meet either requirement may lead to a communication from the Examining Division requesting that you correct this deficiency (R. 137(4) EPC).

The claims applicable on expiry of this period, i.e. those filed on entry into the European phase or in response to the present communication, will form the basis for the calculation of any claims fee to be paid (see page 2).

--2/

Registered letter
EPO Form 1226C 07.10 (NFS) EUCL (08/11/10)

2 Claims fees under Rule 162 EPC

If the application documents on which the European grant procedure is to be based comprise more than fifteen claims, a claimsfee shall be payable for the sixteenth and each subsequent claim within the period provided for in Rule 159(1) EPC.

☑ Based on the application documents currently on file, all necessary claims fees have already been paid (or the documents do not comprise more than 15 claims).

☐ All necessary fees will be/have been debited automatically according to the automatic debit order.

☐ The claims fees due for the claims ..... to ..... were not paid within the above-mentioned period.

Any outstanding claims fee, either based on the current set of claims or on any amended claims to be filed pursuant to Rule 161 EPC (see page 1), may still be validly paid within a **non-extendable period of one month** after notification of this communication (R. 162(2) EPC).

If a payment is made for only some of the claims, you must indicate for which claims it is intended. If a claims fee is not paid in due time, the claim concerned is deemed to be abandoned (R. 162(4) EPC).

If claims fees have already been paid, but on expiry of the above-mentioned period there is a new set of claims containing fewer fee-incurring claims than before, the claims fees in excess of those due under Rule 162(2), second sentence EPC will be refunded (R. 162(3) EPC).

You are reminded that the supplementary search carried out according to Article 153(7) EPC will relate only to the last set of claims applicable on expiry of the above period AND will be confined to those fee-incurring claims for which fees have been paid in due time.

The claims fee is currently

EUR 210 for the 16th and each subsequent claim up to the limit of 50
EUR 525 for the 51st and each subsequent claim

Note to users of the automatic debiting procedure
Unless the EPO receives prior instructions to the contrary, the fees for all claims incurring fees will be debited on the last day of the period for payment. For further details see the Arrangements for the automatic debiting procedure, Supplement to OJ EPO 3/2009.

Important information concerning fee amounts
Following any amendment to the Rules relating to Fees, the amount(s) mentioned in this communication may be different from the amount(s) **actually due on the date of payment.** The latest version of the Schedule of fees and expenses, published as a Supplement to the Official Journal of the EPO, is also available on the EPO website (**www.epo.org**) and can be found under **www.epoline.org**, which allows the viewing, downloading and searching for individual fee amounts, both current and previous.

Payments by cheque delivered or sent direct to the EPO are no longer accepted as from 1 April 2008 (see OJ EPO 2007, 626).

Receiving Section

Europäisches Patentamt
European Patent Office
Office européen des brevets

Payment of fees and expenses

EPO - Munich 75

27. Okt. 2010

European Patent Office
Treasury and Accounts
80298 München
Germany
Fax +49(0)89 2399-4465

Please complete in typescript only

Name of payer

01 Mewburn Ellis LLP

Address

33 Gutter Lane
London EC2V 8AS

02

Payer's reference

TSW261010

Mode of payment

[X] Bank payment/transfer to[1]

[ ] Enclosed cheque No.

[ ] Debit from deposit account with the EPO is requested[2]

Name of bank where EPO account held

DRESDNER BANK

Deposit account No.

Patent application/patent No. (please use a separate form for each application)

03 EP 09731146.8 PCT PCT/US2009/039754 03

	Code		Currency	Amount
04	001	Filing fee (e-filing)	EUR	105.00
05	002	EP Search Fee (ISA = AU,CN,JP,KR,RU,US)	EUR	915.00
06	005	Designation Fee	EUR	525.00
07	006	Examination Fee	EUR	1480.00
08	015	Excess claims fee (8)	EUR	1680.00
09	520	Page fee (7 pages over 35)	EUR	91.00
10			EUR	
11			EUR	
12			EUR	
13			EUR	
14			EUR	
15			EUR	
16			EUR	
17			EUR	
18			EUR	
19			EUR	
20			EUR	
21			EUR	
22		Total	EUR	4796.00

BOOKED by T&A
GEBUCHT durch T&A
COMPTABILISE par T&A

London, 26 October 2010
Place, date

Explanations 1 - 4 see overleaf.

6724736-SJP-P01-20101026-008-001

EPO 1010 12.07

Europäisches Patentamt
European Patent Office
Office européen des brevets

Acknowledgement of receipt

We hereby acknowledge receipt of the form for entry into the European phase (EPO as designated or elected Office) as follows:

Submission number	977499
PCT application number	PCT/US2009/039754
EP application number	09731146.8
Date of receipt	19 October 2010
Receiving Office	European Patent Office, The Hague
Your reference	SJP/FP6724736
Applicant	
Country	

Documents submitted	package-data.xml application-body.xml AMSPECEPO-1.PDF\9119193-v1-to_EPO_18_Oct_2010_-_new_claims_1-23.PDF (4 p.) OTHER-2.PDF\9118976-v1-to_EPO_18_Oct_2010_-_marked_up_claims.PDF (7 p.) feesheetint.pdf (1 p.)	ep-euro-pct.xml epf1200.pdf (5 p.) OTHER-1.pdf\Additional Representatives.pdf (1 p.) OTHER-3.PDF\9119136-v1-to_EPO_18_Oct_2010_-_accompanying_letter.PDF (1 p.)

Submitted by	CN=S. Parry 20806,O=Mewburn Ellis LLP,C=GB
Method of submission	Online
Date and time receipt generated	19 October 2010, 11:39 (CEST)
Message Digest	E1:A2:92:00:EA:E3:4B:33:A9:E3:A5:E5:39:99:0E:86:24:80:57:2B

Correction by the EPO of errors in debit instructions filed by eOLF

Errors in debit instructions filed by eOLF that are caused by the editing of Form 1038E entries or the continued use of outdated software (all forms) may be corrected automatically by the EPO, leaving the payment date unchanged (see decision T 152/82, OJ EPO 1984, 301 and point 6.3 ff ADA, Supplement to OJ EPO 10/2007).

/European Patent Office/

CLAIMS

What is claimed is:

1. An earphone comprising:

a body, wherein the body comprises:

at least one acoustic transducer for converting an analog electrical signal to sound;

an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:

receive digital audio wirelessly from a data source via an ad hoc wireless network when the data source is in wireless communication range with the earphone via the ad hoc wireless network;

transmit data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks; and

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive digital audio via an infrastructure wireless network.

2. The earphone of claim 1, wherein the transceiver circuit comprises:

a wireless communication module;

a processor unit in communication with the wireless communication module;

a non-volatile memory unit in communication with the processor unit; and

a volatile memory unit in communication with the processor unit.

3. The earphone of claim 2, wherein the wireless communication module comprises a Wi-Fi communication module.

4. The earphone of any preceding claim, wherein the transceiver circuit is for receiving digital audio from the data source via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

5. The earphone of any preceding claim, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication via the pre-set infrastructure wireless network.

6. The earphone of any preceding claim, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

7. The earphone of claim 5 or claim 6, wherein the earphone is for receiving streaming digital audio from the host server via the infrastructure wireless network.

8. The earphone of any one of claims 5 to 7, wherein the earphone is for receiving a first network address for a first streaming digital audio content server from the host server via the infrastructure wireless network.

9. The earphone of claim 8, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

10. The earphone of claim 9, wherein the user control comprises a button.

11. A system comprising:

a wireless earphone according to any preceding claim; and

a said data source for wirelessly transmitting streaming digital audio.

12. A system according to claim 11, further comprising a host server that is in communication with the wireless earphone via the infrastructure wireless network.

13. A system according to claim 11 or claim 12, wherein the firmware of the transceiver circuit of the wireless earphone, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to the host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

14. A system according to claim 12 or claim 13; or an earphone according to any one of claims 5 to 10, wherein the host server is for streaming digital audio to the earphone via the infrastructure wireless network.

15. A system according to any one of claims 12 to 14; or an earphone according to any one of claims 5 to 10, wherein the host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the infrastructure wireless network.

16. A system according to any one of claims 11 to 15, further comprising a web page for the wireless earphone through which a user is capable of configuring one or more settings for the wireless earphone.

17. A system or earphone according to any preceding claim, wherein the data source comprises a digital audio player.

18. A system or earphone according to any preceding claim, wherein the infrastructure wireless network comprises a WLAN.

19. A system or earphone according to any preceding claim, wherein the infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.

20. A method comprising:

receiving, by a wireless earphone, via an ad hoc wireless network, digital audio from a data source when the data source is in wireless communication with the earphone via the ad hoc wireless network;

transmitting data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks;

converting, by the wireless earphone, the digital audio to sound; and

when the data source is not in wireless communication with the earphone, transitioning automatically, by the earphone, to receive digital audio via an infrastructure wireless network.

21. The method of claim 20, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises transitioning automatically to receive digital audio from the data source via an infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

22. The method of claim 20, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises transitioning automatically to receive digital audio from a host sever via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

23. The method of claim 20, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises:

receiving, by the wireless earphone via the infrastructure wireless network, from a host server connected to the infrastructure wireless network, a network address for a streaming

digital audio content server; and

connecting, by the wireless earphone, to the streaming digital audio content server using the network address received from the host server.

~~REPLACEMENT SHEET~~

CLAIMS

What is claimed is:

1. An earphone comprising:

a body, wherein the body comprises:

at least one acoustic transducer for converting an analog electrical signal to sound;

an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:

receive digital audio wirelessly from a data source via an ad hoc wireless network when the data source is in wireless communication range with the earphone via the ad hoc wireless network;

transmit data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks; and

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive digital audio via an infrastructure wireless network.

REPLACEMENT SHEET

2 ~~2. The earphone of claim 1, wherein the data source comprises a digital audio player.~~

2 3. The earphone of claim 1, wherein the transceiver circuit comprises:

a wireless communication module;

a processor unit in communication with the wireless communication module;

a non-volatile memory unit in communication with the processor unit; and

a volatile memory unit in communication with the processor unit.

3 4. The earphone of claim 3, wherein the wireless communication module comprises a Wi-Fi communication module.

~~5. The earphone of claim 1, wherein the infrastructure wireless network comprises a WLAN.~~

4 6. The earphone of any preceding claim, wherein the transceiver circuit is for receiving digital audio from the data source via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

~~7. The earphone of claim 6, wherein the infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.~~

5 8. The earphone of any preceding claim, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication via the pre-set infrastructure wireless network.

~~REPLACEMENT SHEET~~

9. The earphone of claim 1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

10. The earphone of claim 9, wherein the earphone is for receiving streaming digital audio from the host server via the infrastructure wireless network.

11. The earphone of claim 9, wherein the earphone is for receiving a first network address for a first streaming digital audio content server from the host server via the infrastructure wireless network.

12. The earphone of claim 11, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

13. The earphone of claim 12, wherein the user control comprises a button.

14. A system comprising:

a data source for wirelessly transmitting streaming digital audio; ~~and~~

a wireless earphone ~~that comprises~~:

~~at least one acoustic transducer for converting an analog electrical signal to sound;~~

~~an antenna; and~~

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit

comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:

receive the streaming digital audio wirelessly from the data source via an ad hoc wireless network when the data source is in wireless communication range with the earphone via the ad hoc wireless network;

transmit data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks; and

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive streaming digital audio via an infrastructure wireless network.

15. The system of claim 14, wherein the data source comprises a digital audio player.

16. The system of claim 14, further comprising a host server that is in communication with the wireless earphone via the infrastructure wireless network.

17. The system of claim 16, wherein the firmware of the transceiver circuit of the wireless earphone, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to the host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

18. The system of claim 16, wherein the host server is for streaming digital audio to the earphone via the infrastructure wireless network.

A system according to any one of claims 12 to 14 or an earphone according to any one of claims 5 to 10

~~REPLACEMENT SHEET~~

15.

19. ~~The system of claim 16,~~ wherein the host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the infrastructure wireless network

20. ~~The system of claim 19, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.~~

21. ~~The earphone of claim 20, wherein the user control comprises a button.~~

16

22. ~~The system of claim 17,~~ further comprising a web page for the wireless earphone through which a user is capable of configuring one or more settings for the wireless earphone.

A system according to any one of claims 11 to 15

18

23. ~~The system of claim 14,~~ wherein the infrastructure wireless network comprises a WLAN.

A system or earphone according to any preceding claim,

19

24. ~~The system of claim 14,~~ wherein the ~~firmware, when executed by the~~ infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.

A system or earphone according to any preceding claim,

25. ~~The system of claim 14, wherein the firmware, when executed by the transceiver circuit,~~ causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication via the pre-set infrastructure wireless network.

26. ~~The system of claim 25, wherein the host server is for streaming digital audio to the earphone via the infrastructure wireless network.~~

17. A system or earphone according to any preceding claim, wherein the data source comprises a digital audio player

REPLACEMENT SHEET

27. The system of claim 25, wherein the host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the infrastructure wireless network

28. The system of claim 27, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

29. The earphone of claim 28, wherein the user control comprises a button.

30. A method comprising:

receiving, by a wireless earphone, via an ad hoc wireless network, digital audio from a data source when the data source is in wireless communication with the earphone via the ad hoc wireless network;

transmitting data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network, wherein the data comprises identification data and signal strength data for the one or more infrastructure wireless networks;

converting, by the wireless earphone, the digital audio to sound; and

when the data source is not in wireless communication with the earphone, transitioning automatically, by the earphone, to receive digital audio via an infrastructure wireless network.

31. The method of claim 30, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises transitioning automatically to

receive digital audio from the data source via an infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

22 20
32. The method of claim 30, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises transitioning automatically to receive digital audio from a host sever via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network

23 20
33. The method of claim 30, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises:

receiving, by the wireless earphone via the infrastructure wireless network, from a host server connected to the infrastructure wireless network, a network address for a streaming digital audio content server; and

connecting, by the wireless earphone, to the streaming digital audio content server using the network address received from the host server.

ADDITIONAL SHEET

Additional Representatives

BAILEY, SAM R.
BRASNETT, ADRIAN H.
CALDERBANK, T. ROGER
CARLISLE, JULIE
CARTER, STEPHEN
CASLEY, CHRISTOPHER
CLEGG, RICHARD I.
CRIPPS, JOANNA E.
DENISON, CHRISTOPHER M.
FORREST, GRAHAM R.
GEE, RACHEL S.
GILL, STEPHEN C.
GREEN, KATHERINE
HACKNEY, NIGEL J.
HARRISON, SUSAN J.
HAYES, EMILY A.L.
HODSDON, STEPHEN
JOHNSON, RICHARD A.
KEIRSTEAD, TANIS E.
KIDDLE, SIMON J.
KING, HILARY M.
KREMER, SIMON M.
LEACH, JAMES
LYONS, JUNE M.
MOORE, GRAEME P.
NAYLOR, MATTHEW J.
NICHOLLS, KATHRYN M.
OXLEY, RACHEL L.
PAGET, HUGH C.E.
PARRY, SIMON J.
SAMPSON, CATHERINE P.
SMITH, MATTHEW K.E.
STONER, G. PATRICK
STUART, IAN
SUTCLIFFE, NICHOLAS R.
TOLLERVEY, REBECCA M.
WALTON, SEÁN M.
WATSON, ROBERT J.
WEBSTER, JEREMY M.
WILLS, A. JONATHAN
WOOLLEY, LINDSEY C.
WYTENBURG, WILHELMUS J.

having an address at:

Mewburn Ellis LLP
33 Gutter Lane
London EC2V 8AS
Great Britain

MewburnEllis
LLP

33 Gutter Lane
London EC2V 8AS

Tel: +44 (0)20 7776 5300
Fax: +44 (0)20 7776 5399
mail@mewburn.com

European Patent Attorneys
European Trade Mark Attorneys
European Design Attorneys
Chartered Patent Attorneys

Partners
Hugh Paget
Roger Calderbank
Patrick Stoner
Seán Walton
Nigel Hackney
Simon Kiddle
Adrian Brasnett
Roger Grimshaw
Simon Kremer
Joanna Cripps
Robert Watson
Christopher Denison
Nicholas Sutcliffe
Sofia Arenal
Matthew Naylor
Stephen Carter
Stephen Gill
Wilhelmus Wytenburg
Graham Forrest
Richard Clegg
Rachel Oxley
Rebecca Tollervey
Jeremy Webster
Richard Johnson
Hilary King
Lindsey Woolley
Simon Parry
Kerry Moroney
Sam Bailey
Graeme Moore
Stephen Hodsdon

Qualified Staff
Robert Andrews
Julie Carlisle
Christopher Casley
Michael Foster
Rachel Gee
Katherine Green
Edmund Harrison
Susan Harrison
Emily Hayes
Sheila Hill
Allan Hoyano
Tanis Keirstead
James Leach
Joseph Lenthall
June Lyons
Kathryn Nicholls
Catherine Sampson
Matthew Smith
Ian Stuart
Rachel White
Jonathan Wills

Consulting Partner
Ian Armitage

www.mewburn.com

European Patent Office
D-80298 München
GERMANY

18 October 2010

BY EPO ON-LINE FILING

Dear Sirs

European Patent Application No. 09731146.8
Regional Phase Entry of International Patent Application No. PCT/US2009/039754
Applicant: Koss Corporation
Our Ref: SJP/FP6724736

I am filing herewith a clean typed set of amended claims to replace the claims filed in response to the written opinion during the International phase of the PCT application. For the Examiner's assistance in tracking the amendments, I am also filing herewith a copy of the claims filed in response to the written opinion, with the amendments shown in manuscript.

Yours faithfully

Simon Parry
AUTHORISED REPRESENTATIVE
MEWBURN ELLIS LLP
Tel: +44 161 247 7722
E-mail: simon.parry@mewburn.com

SJP/JLS

Europäisches Patentamt
European Patent Office
Office européen des brevets

Entry into the European phase (EPO as designated or elected Office)

To the European Patent Office

European application number	EP09731146.8
PCT application number	PCT/US2009/039754
PCT publication number	WO2009126614
Applicant's or representative's reference	SJP/FP6724736
International Filing Date	07.04.2009
International Search Authority (ISA)	US
International Preliminary Examination Authority (IPEA)	Other

1. Applicant

Indications concerning the applicant(s) are contained in the international publication or were recorded by the International Bureau after the international publication. ☒

Changes which have not yet been recorded by the International Bureau are set out here: ☐

2. Representative

This is the representative who will be listed in the Register of European Patents and to whom notifications will be made

Representative 1

Name:	PARRY Simon
Company:	MEWBURN ELLIS LLP
Address of place of business:	33 Gutter Lane
	London, Greater London, EC2V 8AS
	United Kingdom
Telephone:	+44 161 247 7722
Fax:	+44 20 7776 5399
e-mail:	mail@mewburn.com

3. Authorisation

An individual authorisation is attached. ☐

A general authorisation has been registered under No: ☐

A general authorisation has been filed, but not yet registered. ☐

The authorisation filed with the EPO as PCT receiving Office expressly includes the European phase. ☐

4. Request for examination

Examination of the application under Art. 94 EPC is hereby requested. The examination fee is being (has been, will be) paid. ☒

Request for examination in an admissible non-EPO language: ☐

The applicant waives his right to be asked under Rule 70(2) EPC whether he wishes to proceed further with the application. ☐

5. Copies

Additional copies of the documents cited in the supplementary European search report are requested. ☐

Number of additional sets of copies

6. Documents intended for proceedings before the EPO

Number of claims on entry into the European phase: 23

6.1 Proceedings before the EPO as designated Office (PCT I) are to be based on the following documents:

the application documents published by the International Bureau (with all claims, description and drawings), where applicable with amended claims under Art. 19 PCT ☐

unless replaced by the amendments attached. ☐

Where necessary, clarifications should be attached as `Other documents`	
6.2 Proceedings before the EPO as elected Office (PCT II) are to be based on the following documents:	
the documents on which the international preliminary examination report is based, including any annexes	☐
unless replaced by the amendments attached.	☒
Where necessary, clarifications should be attached as `Other documents`	
If the EPO as International Preliminary Examining Authority has been supplied with test reports, these may be used as the basis of proceedings before the EPO.	☒
7. Translations	
Translations in one of the official languages of the EPO (English, French, German) are attached as crossed below:	☐
** In proceedings before the EPO as designated or elected Office (PCT I + II):*	
Translation of the international application (description, claims, any text in the drawings) as originally filed, of the abstract as published and of any indication under Rule 13bis.3 and 13bis.4 PCT regarding biological material	☐
Translation of the priority application(s) (to be filed only at the EPO's request, Rule 53(3) EPC)	☐
It is hereby declared that the international application as originally filed is a complete translation of the previous application (Rule 53(3) EPC)	☐
** In addition, in proceedings before the EPO as designated Office (PCT I):*	
Translation of amended claims and any statement under Art. 19 PCT, if the claims as amended are to form the basis for the proceedings before the EPO (see Section 6).	☐
** In addition, in proceedings before the EPO as elected Office (PCT II):*	
Translation of annexes to the international preliminary examination report	☐
8. Biological material	
The invention uses and/or relates to biological material deposited under Rule 31 EPC.	☐
The particulars referred to in Rule 31(1)(c) EPC (if not yet known, the depositary institution and the identification reference(s)) [number, symbols, etc.] of the depositor) are given in the international publication or in the translation submitted in Section 7 on:	☐
page(s) / line(s)	
The receipt(s) of deposit issued by the depositary institution	
is (are) enclosed.	☐
will be filed later.	☐
Waiver of the right to an undertaking from the requester pursuant to Rule 33(2) EPC attached.	☐
9. Nucleotide and amino acid sequences	
The items pursuant to Rules 5.2 and 13ter PCT, Rules 30 and 163(3) EPC are already with the EPO.	☐
The sequence listing is attached in PDF format.	☐
The sequence listing does not include matter which goes beyond the content of the application as filed.	☐
The sequence listing data is also attached in computer-readable form in accordance with WIPO Standard 25.	☐
The sequence listing data in computer-readable form in accordance with WIPO Standard 25 is identical to the sequence listing in PDF format.	☐
10. Designation fees	
All the contracting states party to the EPC at the time of filing of the international patent application and designated in the international application are deemed to be designated (see Article 79(1) EPC).	☒
AT BE BG CH&LI CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR	
10.1 It is currently intended to pay fewer than seven designation fees, for the following contracting states:	☐
10.2 If contracting states are indicated in Section 10.1, it is agreed that for the	☐

contracting states not thus indicated no communication under Rule 112(1) EPC be issued and further processing be excluded.	
11. Extension of the European patent This application is deemed to be a request to extend the European patent application and the European patent granted in respect of it to all the non-contracting states to the EPC designated in the international application and with which extension agreements are in force on the date on which the international application is filed. However, the extension only takes effect if the prescribed extension fee is paid. It is currently intended to pay the extension fee for the following states: Note: Under the automatic debiting procedure, extension fees will only be debited for states indicated here, unless the EPO is instructed otherwise before expiry of the period for payment.	☐

12. List of enclosed documents

	Description of document	Original file name	Assigned file name
1	Combined Amendments	9119193-v1-to_EPO_18_Oct_2010_-_new_claims_1-23.PDF	AMSPECEPO-1.PDF
1	Additional Representatives	Additional Representatives.pdf	OTHER-1.pdf
2	Marked up claims	9118976-v1-to_EPO_18_Oct_2010_-_marked_up_claims.PDF	OTHER-2.PDF
3	Accompanying letter	9119136-v1-to_EPO_18_Oct_2010_-_accompanying_letter.PDF	OTHER-3.PDF

13. Mode of payment: Not specified	☐
14. Any refunds should be made to the following EPO deposit account: Number and account holder	☒ Mewburn Ellis LLP, 28050013
15. Fees	
16. Annotations **16-1. Note (for EPO) (EP Phase)**	Additional Representatives (MEWBURN ELLIS LLP) Additional representatives are listed in an additional document
16-2. Note (for EPO) (EP Phase)	Precautionary statements (MEWBURN ELLIS LLP) 1. In this application, unless expressly stated otherwise, the cancellation, abandonment or amendment of any claim or any amendment in the description does not amount to abandonment of any subject matter in the application and upon such cancellation, abandonment or amendment the right to reinstate or file divisional applications in respect of any subject matter in the application as filed is maintained. 2. As a matter of precaution, oral proceedings under EPC Art. 116 are requested, to take place in the event that the EPO Receiving Section or the EPO Examining Division forms an intention to refuse the application.
16-3. Note (for EPO) (EP Phase)	Additional fee for applications

	having more than 35 pages (MEWBURN ELLIS LLP) If, following payment of the filing fee, the EPO believes that there is a shortfall in the amount paid for the additional fee, the EPO is authorised to charge that shortfall from EPO deposit account no. 2805.0013 (Mewburn Ellis LLP) under reference number SHORTFALL.

17. Signature(s) of applicant(s) or representative

Place:	**Manchester, GB**
Date:	**19 October 2010**
Signed by:	**GB, Mewburn Ellis LLP, S. Parry 20806**
Capacity:	**(Representative)**

Table for section 6 of Form 1200.3

In accordance with the Notice from the European Patent Office dated 26 January 2009 concerning the 2009 fee structure (OJ EPO 2009, 118, and Guidelines for Examination in the EPO, April 2009, A-III, 13.2), the amount of the additional fee (Art. 2, item 1a, Rules relating to Fees) for the pages of this European patent application is calculated as follows:

Documents intended for proceedings before the EPO (R. 159 (1) (b) EPC) and for calculating the additional fee (Art. 2, item 1a, RFees):

		Page(s) from ... to ...	Number of pages
Description:	International application as published	1	21
Claims:	Amendments filed on entry into European phase	1	4
Drawings:	International application as published	1	16
Abstract:	Default count: one page		1
Total number of pages			42
Fee-exempt pages (Art. 2, item 1a, RFees)			-35
Number of pages to be paid for			7
			(x 13 EUR per page)
Total amount payable		EUR	91

Europäisches Patentamt
European Patent Office
Office européen des brevets

European Patent Office
Postbus 5818
2280 HV RIJSWIJK
NETHERLANDS
Tel. +31 (0)70 340-2040
Fax +31 (0)70 340-3016

For any questions about this communication:
Tel.:+31 (0)70 340 45 00

Koss Corporation
4129 North Port Washington Road
Milwaukee, WI 53212
ETATS-UNIS D'AMERIQUE

Date: 20.08.10

Reference	Application No./Patent No.
	09731146.8 - 1224 PCT/US2009039754

Applicant/Proprietor: Koss Corporation

Entry into the European phase before the European Patent Office

The following information describes the procedural steps required for entry into the European phase before the European Patent Office (EPO). You are advised to read it carefully because failure to take the necessary action in due time can lead to a loss of rights.

1. The above mentioned international patent application has been given the **European application No. 09731146.8**.

2. Applicants **without a residence or their principal place of business** in an EPC Contracting State may themselves initiate European processing of their international applications, provided they do so before expiry of the 31st month from the priority date.

   During the European phase before the EPO as designated or elected Office, however, such applicants **must** be represented by a professional representative (Art. 133(2) and Art. 134(1) and (8) EPC).

   Where, at the expiry of the time period laid down in Rule 163(5) EPC, the requirements of Article 133(2) EPC have not been complied with, the European patent application will be **refused**, pursuant to Rule 163(6) EPC.

   Please note that a professional representative authorised to act before the EPO and who acted for the applicant during the international phase does not automatically become the representative for the European phase. Applicants are therefore strongly advised to appoint in good time any representative they wish to initiate the European phase for them; otherwise the EPO has to send all communications directly to the applicant.

3. Applicants **with a residence or their principal place of business** in an EPC Contracting State are not obliged to appoint for the European phase a professional representative authorised to act before the EPO. However, in view of the complexity of the procedure it is recommended that they do so.

4. Applicants and professional representatives are also strongly advised to initiate the European phase using **EPO Form 1200**. It is available free of charge from the EPO or via the EPO website at **http://www.epo.org**. Similarly, it can be or generated with the epoline® Online Filing Software, obtainable free of charge from the EPO (**http://www.epoline.org**) The use of the form is not compulsory.

5. Where the EPO acts as designated or elected Office (Art. 22(1) and (3) and 39(1) PCT), to enter the European phase before the EPO, the **following acts** must be performed by the applicant within **31 months** from the date of filing of the international application or (where applicable) the earliest priority date:

   a) Supply a translation of the international application into an EPO official language, if the International Bureau did not publish the application in such language (Art. 22(1) PCT and R. 159(1)(a) EPC);

   b) Specify the application documents, as originally filed or as amended, on which the European grant procedure is to be based (R. 159(1)(c) EPC);

   c) Pay the filing fee and, where applicable, the additional fee for a European patent application comprising more than 35 pages (R. 159(1)(c) EPC, Art. 2, items 1, 1a Rules relating to Fees);

   d) Pay the search fee where a supplementary European search report has to be drawn up (R. 159(1)(e) EPC);

   e) Pay the designation fee if the time limit laid down in Rule 39(1) EPC (i.e. six months after publication of the international search report) has expired before the 31-month period pursuant to Rule 159(1) EPC (R. 159(1)(d) EPC);

   f) File the written request for examination and pay the examination fee if the time limit laid down in Rule 70(1) EPC has expired before the 31-month period pursuant to Rule 159(1) EPC (R. 159(1)(f) EPC);

   g) Pay the renewal fee in respect of the third year, if the fee has fallen due (see Rule 51(1) EPC) before expiry of the 31-month period pursuant to Rule 159(1) EPC (R. 159(1)(g) EPC);

   h) File, where applicable, the certificate of exhibition referred to in Article 55(2) and Rule 25 EPC (R. 159(1)(h) EPC);

   i) Pay the claims fees for the sixteenth and each subsequent claim when the application documents on which the European grant procedure is to be based comprise more than fifteen claims (R. 162(1) EPC). For applications entering the European phase on or after 1 April 2009, a higher amount is payable for the 51st and each subsequent claim (Decision of the Administrative Council of 14 December 2007 amending the Rules relating to Fees, OJ EPO 2008, 10).

If either the translation of the international application or the request for examination is not filed in time, or if the filing fee, the additional fee, the search fee, the designation fee or the examination fee is not paid in due time, the application shall be deemed to be withdrawn (R. 160(1) EPC).

6. Payment of fees

   The amounts of fees are set out in the Schedule of fees and expenses, which is published from time to time as a supplement to the Official Journal of the EPO. Applicants should always check the fee amounts applying at the time of payment.

   Payments can be validly made by any person. Permissible methods of payment are laid down in Article 5 RFees. Please note that payment cannot be made by cheque sent to the EPO.

   For information on the calculation of the additional fee for applications comprising more than 35 pages, see Notice from the European Patent Office dated 26 January 2009 concerning the 2009 fee structure, OJ EPO 2/2009, 118, and Guidelines for Examination in the EPO, April 2009, A-III, 13.2. For an overview of search and examination fees, see Notice from the European Paten Office of 11 February 2008 (OJ EPO 2008, 130).

   The above and further fee-related information is available on the EPO website (**http://www.epo.org**).

7. If the applicant had appointed a representative during the application's international phase, the present Form will be sent to the representative, asking him to inform the applicant accordingly.

   All subsequent communications will be sent to the applicant, or - if the EPO is informed of his appointment in time - to the applicant's European representative.

8. For more details about time limits and procedural acts before the EPO as designated or elected Office, see the EPO brochure "How to get a European patent", Guide for applicants - Part 2, PCT procedure before the EPO - "Euro-PCT".

   This brochure, the list of professional representatives before the EPO as well as Form 1200 are available on the Internet under **http://www.epo.org**.

Receiving Section

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF THE RECORDING OF A CHANGE

(PCT Rule 92*bis*.1 and Administrative Instructions, Section 422)

To:

KNEDEISEN, Mark, G.
K&L Gates LLP
K&L Gates Center
210 Sixth Avenue
Pittsburgh, PA 15222-2613
ETATS-UNIS D'AMERIQUE

Date of mailing *(day/month/year)*
09 August 2010 (09.08.2010)

Applicant's or agent's file reference
080188PCT

IMPORTANT NOTIFICATION

International application No.
PCT/US2009/039754

International filing date *(day/month/year)*
07 April 2009 (07.04.2009)

1. The following indications appeared on record concerning:

☐ the applicant ☐ the inventor ☒ the agent ☐ the common representative

Name and Address
KNEDEISEN, Mark, G.
K&L Gates LLP
Henry W. Oliver Building
535 Smithfield Street
Pittsburgh, PA 15222-2312
United States of America

State of Nationality:
State of Residence:
Telephone No.: (412) 355-6342
Facsimile No.: (412) 355-6501
E-mail address:

2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person ☐ the name ☒ the address ☐ the nationality ☐ the residence

Name and Address
KNEDEISEN, Mark, G.
K&L Gates LLP
K&L Gates Center
210 Sixth Avenue
Pittsburgh, PA 15222-2613
United States of America

State of Nationality:
State of Residence:
Telephone No.: (412) 355-6288
Facsimile No.: (412) 355-6501
E-mail address: mark.lavender@klgates.com
☐ Notifications by e-mail authorized

3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office
☐ the International Searching Authority
☐ the Authority(ies) specified for supplementary search
☒ the International Preliminary Examining Authority
☐ the designated Offices concerned
☒ the elected Offices concerned
☐ other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 90 90

Authorized officer
Calcagno Remy
e-mail pt07.pct@wipo.int
Telephone No. +41 22 338 74 07

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Article 31(7) and Rule 61.2)

To:

European Patent Office
Postbus 5818
Patentlaan 2
NL-2280 HV RIJSWIJK
PAYS-BAS

in its capacity as elected Office

Date of mailing *(day/month/year)* 04 March 2010 (04.03.2010)	
International application No. PCT/US2009/039754	Applicant's or agent's file reference 080188PCT
International filing date *(day/month/year)* 07 April 2009 (07.04.2009)	Priority date *(day/month/year)* 07 April 2008 (07.04.2008)
Applicant KOSS CORPORATION et al	

1. The designated Office is hereby notified of its election made in the demand filed with the International Preliminary Examining Authority on:

   03 December 2009 (03.12.2009)

2. The election ☑ was

   ☐ was not

   made before the expiration of 19 months from the priority date (PCT Article 39(1)(a)).

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. +41 22 338 82 70

Authorized officer

Yoshiko Kuwahara

e-mail: pt07.pct@wipo.int

Document made available under the Patent Cooperation Treaty (PCT)

International application number: PCT/US2009/039754

International filing date: 07 April 2009 (07.04.2009)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 61/123,265
Filing date: 07 April 2008 (07.04.2008)

Date of receipt at the International Bureau: 07 May 2009 (07.05.2009)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)

162757

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

May 06, 2009

THIS IS TO CERTIFY THAT ANNEXED HERETO IS A TRUE COPY FROM THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE OF THOSE PAPERS OF THE BELOW IDENTIFIED PATENT APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A FILING DATE.

APPLICATION NUMBER: *61/123,265*
FILING DATE: *April 07, 2008*
RELATED PCT APPLICATION NUMBER: *PCT/US09/39754*

THE COUNTRY CODE AND NUMBER OF YOUR PRIORITY APPLICATION, TO BE USED FOR FILING ABROAD UNDER THE PARIS CONVENTION, IS *US61/123,265*

Certified by

Under Secretary of Commerce
for Intellectual Property
and Director of the United States
Patent and Trademark Office

U.S. PTO
61/123265
04/07/2008

040708 02570 U.S. PTO

PTO/SB/16 (10-07)
Approved for use through 06/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PROVISIONAL APPLICATION FOR PATENT COVER SHEET – Page 1 of 2

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EB616632942US Mailed: April 7, 2008

INVENTOR(S)		
Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Steven	Reckamp	Sun Prairie, WI
Michael	Pelland	Princeton, WI
Michael	Koss	Milwaukee, WI
Greg	Hollingstad	Stoughton, WI
Morgan	Lowery	Lodi, WI

Additional inventors are being named on the _____ separately numbered sheets attached hereto

TITLE OF THE INVENTION (500 characters max):

HEADPHONE WITH WIRELESS NETWORK TRANSCEIVER

Direct all correspondence to: **CORRESPONDENCE ADDRESS**

☑ The address corresponding to Customer Number: 26285

OR

☐ Firm or Individual Name

Address

City	State	Zip
Country	Telephone	Email

ENCLOSED APPLICATION PARTS *(check all that apply)*

☐ Application Data Sheet. See 37 CFR 1.76

☐ CD(s), Number of CDs _____

☑ Drawing(s) *Number of Sheets* 4

☐ Other (specify) _____

☑ Specification (e.g. description of the invention) *Number of Pages* 19

Fees Due: Filing Fee of $210 ($105 for small entity). If the specification and drawings exceed 100 sheets of paper, an application size fee is also due, which is $260 ($130 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

METHOD OF PAYMENT OF THE FILING FEE AND APPLICATION SIZE FEE FOR THIS PROVISIONAL APPLICATION FOR PATENT

☑ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check or money order is enclosed to cover the filing fee and application size fee (if applicable).

☐ Payment by credit card. Form PTO-2038 is attached

$105.00

TOTAL FEE AMOUNT ($)

☑ The Director is hereby authorized to charge the filing fee and application size fee (if applicable) or credit any overpayment to Deposit Account Number: 11-1110. A duplicative copy of this form is enclosed for fee processing.

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/16 (10-07)
Approved for use through 06/30/2010. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☑ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

SIGNATURE Mark Knedeisen Date April 7, 2008

TYPED or PRINTED NAME Mark G. Knedeisen REGISTRATION NO. 42,747 *(if appropriate)*

TELEPHONE (412) 355-6342 Docket Number: 080188P

PATENT
Docket No. 080188P

HEADPHONE WITH WIRELESS NETWORK TRANSCEIVER

Inventors: Steven Reckamp, a resident of Sun Prairie, WI;
Michael Pelland, a resident of Princeton, WI;
Michael Koss, a resident of Milwaukee, WI;
Greg Hollingstad, a resident of Stoughton, WI; and
Morgan Lowery, a resident of Lodi, WI

BACKGROUND

[0001] Digital audio players, such as MP3 players and iPods, that store and play digital audio files, are very popular. Such devices typically comprise a data storage unit for storing and playing the digital audio, and a headphone set that connects to the data storage unit, usually with a ¼" or a 3.5 mm jack and associated cord. Often the headphones are in-ear type headphones. The cord, however, between the headphones and the data storage unit can be cumbersome and annoying to users, and the length of the cord limits the physical distance between the data storage unit and the headphones. Accordingly, some cordless headphones have been proposed, such as the Monster iFreePlay cordless headphones from Apple Inc., which includes a docking port that can connect directly to an iPod Shuffle. Because they have the docking port, however, the Monster iFreePlay cordless headphones from Apple are quite large and are not in-ear type phones. In addition, headphones that connect wirelessly via IEEE 802.11 to a WLAN-ready laptop or personal computer (PC) have been proposed, but such headphone are also quite large and not in-ear type phones.

SUMMARY

[0002] In one general aspect, the present invention is directed to a speakerphone set where the speakerphones comprise a wireless network transceiver for receiving streaming audio from a data source, such as digital audio player or a computer, over a local ad hoc wireless network. When the data source and the speakerphone set are out of range, they may transition to an infrastructure wireless network (e.g., wireless LAN). If there is no common infrastructure wireless network for both the data source and the speakerphone set, they may both connect via the Internet to a host server, which may receive the data from the data source and transmit it to the speakerphone set. These and other advantageous, unique aspects of the speakerphones are described below.

FIGURES

[0003] Various embodiments of the present invention are described herein by way of example in conjunction with the following figures, wherein:

Figure 1 is diagram of a wireless network comprising a headset with speakerphones according to various embodiments of the present invention;

Figure 2A shows an in-ear speaker element of the headset of Figure 1 according to various embodiments of the present invention;

Figure 2B shows a speakerphone set according to other embodiments of the present invention;

Figure 3 is a diagram of a speakerphone according to various embodiments of the present invention; and

Figure 4 is a diagram of a speakerphone set with a dongle according to various embodiments of the present invention.

DESCRIPTION

[0004] Figure 1 is a diagram of a communication system according to various embodiments of the present invention. The system comprises a data source 10 and a headset 12 comprising one or more speakerphones 14. As shown in the embodiment of Figure 1, the speakerphones 14 may comprise an in-ear speaker element 16, shown better in Figure 2A, although in other embodiments the speakerphones 14 may comprise on-ear or over-ear speaker elements. Each speakerphone 14 may have its own wireless data transceiver 18, described in more detail below in connection with Figure 3. The speakerphones 14, via their associated wireless data transceivers 18, may communicate wirelessly with a data source 20, which may comprise a wireless network adapter 22. For example, the data source 20 may be digital audio player (DAP), such as an mp3 player or an iPod, or any other suitable device, such as a laptop or personal computer, that stores digital audio files. The digital audio files may be for example, (i) compressed audio files, such as mp3, lossy or lossless WMA, Vorbis, Musepack, FLAC, or any other suitable format, or (ii) uncompressed audio files, such as WAV, AIFF, AU, or any other suitable uncompressed file format.

[0005] When in range, the data source 20 may communicate with the wireless transceivers 18 of the headset 10 via an ad hoc wireless network 21 using any suitable wireless communication protocol, including Wi-Fi (e.g., IEEE 802.11a/b/g/n), WiMAX (IEEE 802.16), Bluetooth, Zigbee, UWB, or any other suitable communication protocol. For purposes of the description to follow, it is assumed that the data source 20 and the wireless transceivers 20 communicated using a Wi-Fi protocol.

[0006] When the headset 12 is out of wireless communication range with the data source 20, both the headset 12 and the data source 20 may transition to communicate over an infrastructure wireless network (such as a wireless LAN (WLAN)) that is in the range of both the headset 12 and the data source 20. For example, the infrastructure network may comprise a number of access points, including a first access point 30 in the range of the data source 20 and a second access point 34 in the range of the headset 12.

[0007] If there is no infrastructure wireless network that is in the range of both the headset 12 and the data source 20, the headset 12 and the data source 20 may transition to communicate over a local infrastructure wireless network (such as a wireless LAN (WLAN)). They may both transition to an agreed-upon WLAN or to the WLAN having the strongest signal. A procedure for specifying the agreed-upon infrastructure wireless networks is described further below.

[0008] If there is no suitable common infrastructure wireless network over which the headset 12 and the data source 20 can communicate, the data source 20 may transition to communicate with an access point 30 for a first wireless network 32 (such as a WLAN) that is in the range of the data source 20. Similarly, the wireless transceivers 18 of the speakerphones 14 may transition to communicate with an access point 34 over a second wireless network (e.g., WLAN) 36 that is in the range of the speakerphones 14. In such a communication mode, the data source 20 may transmit (e.g., stream) its audio data over the wireless network 32 to a host server 40, connected to the access point 30 via a communication network 42, such as the Internet. The host server 40 may then transmit (e.g., stream) the audio data that it received from the data source to the speakerphones 14 of the headset 12 via the communication network 42 and the wireless network 36. In that way, even when the wireless transceivers 18 of the headset 12 are out of direct range from the data source 20, the wireless transceivers 18 can still receive the streaming

audio data from the data source 20. That way, the data source 20 thereby could serve as audio source for the wearer of the headset 12 even when the wearer/user is not physically near to the data source 20. The operation of transitioning from the ad hoc network 21 to infrastructure wireless networks is described in more detail below.

[0009] The wireless network adapter 22 may be part of the data source 20, or it may be a separate device that is connected to the data source 20 to provide wireless connectivity. For example, the wireless network adapter 22 may comprise a wireless network interface card (WNIC) or other suitable transceiver that plugs into a USB port or a jack of the data source 20 (such as a TRS connector) to stream data, e.g., audio files, to the speakerphones 14.

[0010] In the embodiment shown in Figure 1, the headset 12 comprises a behind-the-head headband 24 connected to each of the speakerphones 14. In other embodiments, the headset 12 may comprise an over-the-head headband 24. In addition, in some embodiments the headset 12 may not comprise any type of headband, but rather just comprise two speakerphones 14, such as in-ear earbuds, as shown in the example of Figure 2B, each with its own wireless data transceiver 18. In such embodiments, the earbud speakerphones 14 may comprise a string or some other cord-type connector to keep the speakerphones 14 from being separate and lost.

[0011] In some embodiments, especially ones with a headband 24, only one of the speakerphones 14 may comprise a wireless data transceiver 18, and the headband 24 may carry a wired connection to the other speakerphone 14, which does not have a wireless transceiver 18.

[0012] Figure 3 is a block diagram of one of the speakerphones 14 according to various embodiments of the present invention. In the illustrated embodiment, the speakerphone 14 comprises a single integrated circuit (IC) 100 and related peripheral components. The IC 100 may comprise a system-on-chip (SoC), which is conducive to miniaturizing the components of

the speakerphones 14, which is advantageous if the speakerphones 14 are to be relatively small in size, such as in-ear speakerphones 14. In alternative embodiments, however, the component of the SoC could be realized with two or more discrete IC, such as separate ICs for the processors, memory, and Wi-Fi module.

[0013] As shown in Figure 3, the peripheral components speakerphone 14 may comprise a power source 102, a microphone 104, one or more acoustic transducers 106 (e.g., speakers), and an antenna 108.

[0014] The power source 102 may comprise, for example, a rechargeable or non-rechargeable battery (or batteries). In other embodiments, the power source 102 may comprise one or more ultracapacitors (sometimes referred to as supercapacitors) that are charged by a primary power source. In embodiments where the power source 102 comprises a rechargeable battery cell or an ultracapacitor, the battery cell or ultracapacitor, as the case may be, may be charged for use, for example, when the headset 12 is connected to a docking station, in either a wired or wireless (e.g., Bluetooth) connection. The docking station may be connected to or part of a computer device, such as a laptop computer or PC. In addition to charging the rechargeable power source 12, the docking station may facilitate downloading of data to and/or from the headset 12. In other embodiments, the power source 102 may comprise capacitors passively charged with RF radiation, such as described in U.S. Patent No. 7,027,311. The power source 102 may be coupled to a power source control module 103 of the IC 100 that controls and monitors the power source 102.

[0015] The acoustic transducer(s) 106 may be the speaker element(s) for conveying the sound to the user of the headset 12. According to various embodiments, each speakerphone 14 may comprise one or more acoustic transducers 106. For embodiments having more than one

transducer, one transducer may be larger than the other transducer, and a crossover circuit (not shown) may transmit the higher frequencies to the smaller one and may transmit the lower frequencies to the larger transducer.

[0016] The antenna 108 may receive and transmit the wireless signals from and to the ad hoc wireless network 21 and the WLAN 36. A Wi-Fi module 110 in communication with the antenna 108 may, among other things, modulate and demodulate the signals transmitted from and received by the antenna 108. The Wi-Fi module 110 communicates with a baseband processor 112, which performs other functions necessary for the device to communicate using the Wi-Fi (or other communication) protocol.

[0017] The baseband processor 112 may be in communication with a processor unit 114, which comprises a microprocessor 116 and the digital signal processor (DSP) 118. The microprocessor 116 may control the various components of the IC 100. The DSP 114 may, for example, perform various sound quality enhancements to the digital audio signal received baseband processor 112, including noise cancellation and sound equalization. The processor unit 114 may be in communication with a volatile memory unit 120 and a non-volatile memory unit 122. A memory management unit 124 may control the processor unit's access to the memories 120, 122. The volatile memory 122 may comprise, for example, a random access memory (RAM). The non-volatile memory unit 122 may comprise a read only memory (ROM) and/or flash memory.

[0018] A digital-to-analog converter (DAC) 125 may convert the digital audio signals from the processor unit 114 to analog form for coupling to the acoustic transducer(s) 106. An I^2S interface 126 or other suitable serial or parallel bus interface may provide the interface between the processor unit 114 and the DAC 125. An analog-to-digital converter (ADC) 128, which also

communicates with the I^2S interface 126, converts analog audio signal picked up by the microphone 104 for processing by the processor unit 100.

[0019] The IC 100 also may comprise a USB or other suitable interface 130 that allows the speakerphone 14 to be connected to an external device via a USB cable or other suitable link. In that way, the speakerphone 14 could connected directly to a data source, such as a DAP or computer, through its USB port, to act as a conventional DAP. In addition, through the USB port, the speakerphone 12 may connect to a PC or docking station to charge up the power source and/or to get downloads (e.g., data or firmware).

[0020] The headset 12 may host an associated web page. An authenticated user could log onto the headset from a client computing device 50 (e.g., laptop, PC, handheld computer device, etc., including the data source 20) to access the web page for the headset 12 to set various profile values for the headset 12. For example, at the web site, the user could adjust various sound control features, such as treble, bass, frequency settings, noise cancellation settings, etc. In addition, the user could set preferred streaming audio stations, such as preferred Internet radio stations. That way, instead of listening to streaming audio from the data source 20, the user could listening to Internet radio stations or other streaming audio broadcasts received by the speakerphones 14. A button (not shown) on the headset 12 may allow the user to cycle through the preset preferred streaming audio broadcasts.

[0021] At the web site hosted on the host server, in addition to establishing the identification of audio sources and headphones, the user could set parental or other user controls. For example, the user could restrict certain Internet radio broadcasts based on content or parental ratings, etc. In addition, if a number of headsets 12 are registered to the same user, the user could define separate controls for the various headsets 12 (as well as customize any other preferences or

settings particular to a headset 12, including Internet radio stations, equalization settings, etc. that would later be downloaded to the headphones). In addition, the host server 40 may log the files streamed to the various headsets 12, and the user could view at the web site the files that were played by the headsets 12. In that way, the user could monitor the files played by the headsets 12.

[0022] In addition, the host server 40 may provide a so-called eavesdropping function. The service could be activated via the web site. When the service is activated, the host server 40 may transmit the content that it is delivering to a first headset 12 to another, second headset 12. That way, the user of the second headset 12, which may be a parent, may directly monitor the content being played by the first headset 12, which may belong to a child of the parent. This function could be present in the headphones themselves, allowing a parent to join an ad-hoc network and listen to what the children are listening.

[0023] At the web site, the user may also specify the identification number, and the host processor translates this ID to the current IP addresses for the speakerphones 14 and for the data source 20. This allows the user to find his or her data source even though it is behind a firewall or on a changing IP address. That way, when the data source 20 and the speakerphones 14 are communicating via the host server 40, the host server 40 can match the audio from the data source 20 to the appropriate speakerphones 14 based on the specified device ID. The user could also specify a number of different data sources. For example, the user's DAP may have one specified IP address and the user's home (or work) computer may have another specified IP address.

[0024] The host server 40 (or some other server) may also push firmware upgrades and/or data updates to the headset 12 using the IP addresses of the speakerphone 14. In addition, a user

could download the firmware upgrades and/or data updates to the client computing device 50, and then download the firmware upgrades and/or data updates to the headset 12 when the headset is connected to the client computer device 50 (such as through a USB port and/or a docking station). Whether the downloads are transmitted wirelessly to the headset 12 or via the client computing device 50 may depend on the current data rate of the headset 12 and the quantity of data to be transmitted to the headset 12. For example, the host server 12 may make a determination, based on the current data rate for the headset 12 and the size of the update, whether the update should be pushed to the headset via the WLAN 36. If update is too large and/or the current data rate is too low that the performance of the headset 12 will be adversely affected, the host server 12 may refrain from pushing the update to the headset 12 and wait instead to download the update to the client computing device 50. Also, the headphone could connect directly to the internet and download its own update.

[0025] As mentioned above, the processor unit 114 of the speakerphones 14 may be programmed, via firmware stored in the memory 120, 122, to have the ability to transition from the ad hoc wireless network 21 to an infrastructure wireless network such as a WLAN when the quality of the signal on the ad hoc wireless network 21 degrades below a suitable threshold (such as when the data source 20 is out of range). In that case, the speakerphones 14 and the data source 20 may connect to the same infrastructure wireless network (WLAN). Through the web site for the headset 12, described above, the user could specify a priority of infrastructure wireless networks to connect to. For example, the user could specify a WLAN servicing his/her residence first, a WLAN servicing his/her place of employment second, etc. During the time that the speakerphones 14 and the data source 20 are connected via the ad hoc wireless network 21, the speakerphones 14 and the data source 20 may exchange data regarding which infrastructure

networks are in range. When the headset 12 and the data source 20 are no longer in range, they may both transition to the highest prioritized infrastructure wireless network whose signal strength is above a certain threshold level. That way, even though the speakerphones 14 and the data source 20 are out of range, the speakerphones 14 may still receive the streaming audio from the data source 20 via the infrastructure network.

[0026] When none of the preferred infrastructure networks is in range, the speakerphones 14 and the data source 20 may connect to, if authenticated, to the infrastructure network that had the highest signal level the last time the speakerphones 14 and the data source 20 exchanged data over the ad hoc network 21 regarding infrastructure networks that were in range. If no infrastructure network is in range of both the speakerphones 14 and the headset 20, or if the speakerphones 14 and the headset 20 were unable to exchange infrastructure network data via the ad hoc wireless network 21, the speakerphones 14 and the data source 20 may both attempt to connect to the host server 40 via different wireless networks 32, 36. The host server 40, as mentioned above, may match the data from the data source 20 to the appropriate speakerphones 14 based on the specified IP addresses. That way, the data source 20 can transmit the audio to the host server 40 via the WLAN 32 and the communication network 42, and the host server 40 can transmit the audio to the headset 12 via the communication network 42 and the WLAN 36.

[0027] In one embodiment, the host server 40 (or some other server) may serve as an IP radio station for the headset 12 when the headset 12 is not listening to audio transmitted from the data source 20. In such an embodiment, the host server 40 may crawl the Internet looking for Internet radio broadcasts. The host server 40 may then broadcast an Internet radio station to the headset 12 using the headset's specified IP address and the preconfigured preferred IP internet radio stations established by the user.

[0028] In various embodiments, the headset 12 may comprise a button (not shown), such as on the speakerphone 14, that allows the wearer of the speakerphones 14 to indicated approval and/or disapproval of songs or other audio files listened to by the wearer over an Internet radio station. The approval/disapproval rating may be transmitted from the headset 12 back to the host server 40, which may log the ratings for the various songs/audio files. The host server 40 (or some other server) may then send an email or other electronic communication to the headset user, which the user might access from the client communication device 50. The email or other electronic communication may contain a listing of the song/audio files for which the user gave approval and/or disapproval ratings. Further, the email or other electronic communication may provide a link by which the user could download song/audio files that the user rated (presumably song/audio files for which the user gave an approval rating). In some instances, the user may be required to pay a fee to download the song/audio file.

[0029] The rating system would also be used by the host server 40 to determine the user's musical preferences and offer new music that the user might enjoy. According to various embodiments, this service may be similar to the services at pandora.com.

[0030] In addition or alternatively, the user could log onto a web site hosted by the host server 40 (or some other server) to view the approval/disapproval ratings. The web site may provide the user with the option of downloading rated songs/audio files.

[0031] Another application of the headsets may be in vehicles equipped with Wi-Fi or other wireless network connectivity. Published PCT application WO 2007/136620, which is incorporated herein by reference, discloses a wireless router for providing a Wi-Fi or other local wireless network for a vehicle, such as a car, truck, boat, bus, etc. In a vehicle having a Wi-Fi or other local wireless network, the audio for other media systems in the vehicle could be broadcast

over the vehicle's wireless network. For example, if the vehicle comprises a DVD player, the audio from the DVD system could be transmitted to the router and broadcast over the vehicle's network. Similarly, the audio from terrestrial radio stations, a CD player, or an audio cassette player could be broadcast over the vehicle's local wireless network. The vehicle's passengers, equipped with the speakerphones 14, could cycle through the various audio broadcasts (including the broadcasts from the vehicle's media system as well as broadcasts from the host server 40, for example) using a selection button on the speakerphones 14 or the headset 12. The vehicle may also be equipped with a console or terminal, etc., through which a passenger could mute all of the broadcasts for direct voice communications, for example.

[0032] As described above in connection with Figure 3, the speakerphones 14 may also include a microphone. The microphone could be used to broadcast communications from one headset wearer to another headset wearer. For example, one wearer could activate the microphone by pressing a button on the headset 12 (such as one the microphone). The speakerphone 12 may then transmit a communication via the WLAN to a nearby recipient (or recipients) equipped with the headset 12. When such communication is detected by the recipient's headphones 14, the streaming audio received over the wireless network may be muted, and the intercom channel may be routed to the transducer(s) for playing for the recipient. This functionality may be valuable and useful where multiple wearers of the headset 12 are in close proximity, such as on motorcycles, for example. The WLAN could be an ad hoc network or infrastructure based network.

[0033] Another exemplary use of the speakerphones 14 is in a factory, warehouse, construction site, or other environment that might be noisy. Persons (e.g., workers) in the environment could use the speakerphones 14 for protection from the surrounding noise of the environment. From a

console or terminal, a person (e.g., a supervisor) could select a particular recipient for a communication over the Wi-Fi network (or other local wireless network). The console or terminal may have buttons, dials, or switches, etc., for each user/recipient, or it could have one button or dial through which the sender could cycle through the possible recipients. In addition, the console or terminal could have a graphical user interface, through which the sender may select the desired recipient(s).

[0034] As mentioned above, the speakerphones 14 may comprise a USB port. In one embodiment, as shown in Figure 4, the user may use an adapter 150 that connects to the USB port of each speakerphone 14. The adapter 150 may also have a plug connector 152, such as a 3.5 mm jack, which allows the user to connect the adapter 150 to devices having a corresponding port for the connector 152. When the speakerphones 14 detect a connection via their USB interfaces in such a manner, the Wi-Fi (or other wireless protocol) components may shut down or go into sleep mode, and the speakerphones 14 will route standard headphone level analog signals to the transducer. This may be convenient in environments where wireless communications are not permitted, such as airplanes, but where there is a convenient source of audio contact. For example, the adapter 150 could plug into a person's DAP. The DSP __ of the speakerphone 14 may still be operational in such a non-wireless mode to provide noise cancellation and any applicable equalization.

[0035] According to various embodiments, the docking station for the headset 12 may comprise a communication port for communicating with a sound system, such as home stereo system, for example. The communication port of the docking station may support an optical communication link, such as TOSLINK, or any other suitable communication link. That way, the headset 12 could act as a receiver or a source for the connected sound system.

[0036] The examples presented herein are intended to illustrate potential and specific implementations of the embodiments. It can be appreciated that the examples are intended primarily for purposes of illustration for those skilled in the art. No particular aspect of the examples is/are intended to limit the scope of the described embodiments.

[0037] It is to be understood that the figures and descriptions of the embodiments have been simplified to illustrate elements that are relevant for a clear understanding of the embodiments, while eliminating, for purposes of clarity, other elements. For example, certain operating system details for the various computer-related devices and systems are not described herein. Those of ordinary skill in the art will recognize, however, that these and other elements may be desirable in a typical processor or computer system. Because such elements are well known in the art and because they do not facilitate a better understanding of the embodiments, a discussion of such elements is not provided herein.

[0038] In general, it will be apparent to one of ordinary skill in the art that at least some of the embodiments described herein may be implemented in many different embodiments of software, firmware and/or hardware. The software and firmware code may be executed by a processor or any other similar computing device. The software code or specialized control hardware that may be used to implement embodiments is not limiting. For example, embodiments described herein may be implemented in computer software using any suitable computer software language type. Such software may be stored on any type of suitable computer-readable medium or media, such as, for example, a magnetic or optical storage medium. The operation and behavior of the embodiments may be described without specific reference to specific software code or specialized hardware components. The absence of such specific references is feasible, because it is clearly understood that artisans of ordinary skill would be able to design software and control

hardware to implement the embodiments based on the present description with no more than reasonable effort and without undue experimentation.

[0039] Moreover, the processes associated with the present embodiments may be executed by programmable equipment, such as computers or computer systems and/or processors. Software that may cause programmable equipment to execute processes may be stored in any storage device, such as, for example, a computer system (nonvolatile) memory, an optical disk, magnetic tape, or magnetic disk. Furthermore, at least some of the processes may be programmed when the computer system is manufactured or stored on various types of computer-readable media.

[0040] A "computer," "computer system," "host," or "processor" may be, for example and without limitation, a processor, microcomputer, minicomputer, server, mainframe, laptop, personal data assistant (PDA), wireless e-mail device, cellular phone, pager, processor, fax machine, scanner, or any other programmable device configured to transmit and/or receive data over a network. Computer systems and computer-based devices disclosed herein may include memory for storing certain software applications used in obtaining, processing, and communicating information. It can be appreciated that such memory may be internal or external with respect to operation of the disclosed embodiments. The memory may also include any means for storing software, including a hard disk, an optical disk, floppy disk, ROM (read only memory), RAM (random access memory), PROM (programmable ROM), EEPROM (electrically erasable PROM) and/or other computer-readable media.

[0041] In various embodiments disclosed herein, a single component may be replaced by multiple components and multiple components may be replaced by a single component to perform a given function or functions. Except where such substitution would not be operative, such substitution is within the intended scope of the embodiments. Any servers described herein,

for example, may be replaced by a "server farm" or other grouping of networked servers (such as server blades) that are located and configured for cooperative functions. It can be appreciated that a server farm may serve to distribute workload between/among individual components of the farm and may expedite computing processes by harnessing the collective and cooperative power of multiple servers. Such server farms may employ load-balancing software that accomplishes tasks such as, for example, tracking demand for processing power from different machines, prioritizing and scheduling tasks based on network demand and/or providing backup contingency in the event of component failure or reduction in operability.

[0042] While various embodiments have been described herein, it should be apparent that various modifications, alterations, and adaptations to those embodiments may occur to persons skilled in the art with attainment of at least some of the advantages. The disclosed embodiments are therefore intended to include all such modifications, alterations, and adaptations without departing from the scope of the embodiments as set forth herein.

CLAIMS

What is claimed is:

1 An earphone as described herein.

ABSTRACT

A speakerphone set where the speakerphones comprise a wireless network transceiver for receiving streaming audio from a data source over a local ad hoc wireless network. When the data source and the speakerphone set are out of range, they transition to an infrastructure wireless network. If there is no common infrastructure wireless network for both the data source and the speakerphone set, they connect via the Internet to a host server, which may receive the data from the data source and transmit it to the speakerphone set.

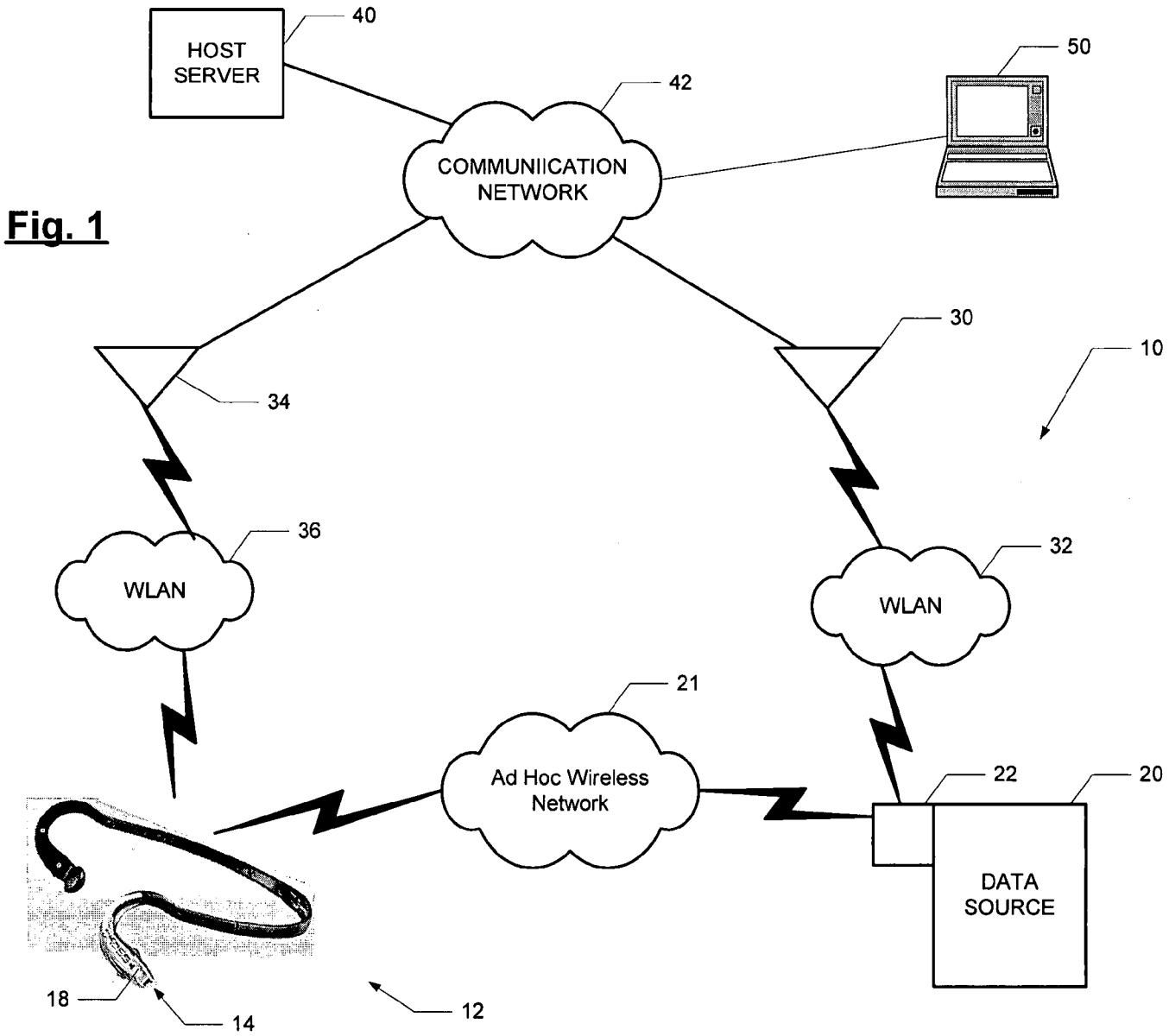

Fig. 1

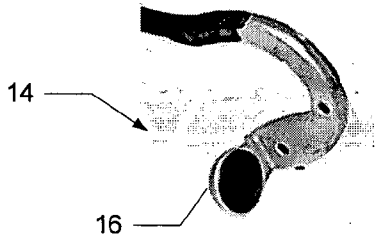

Fig. 2A

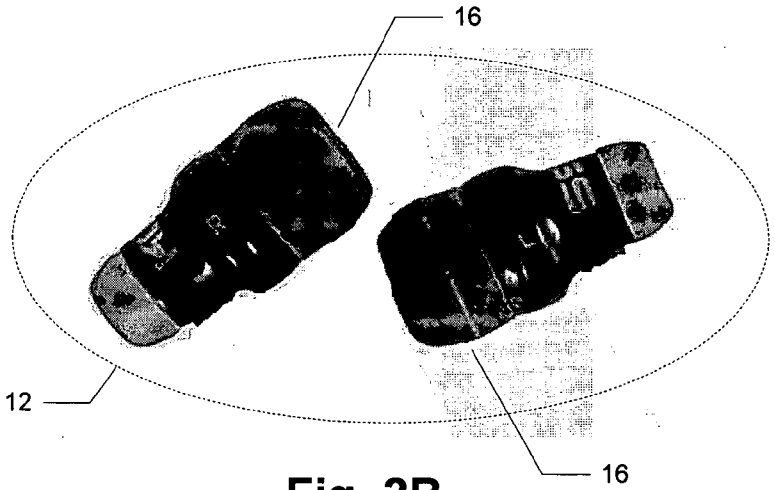

Fig. 2B

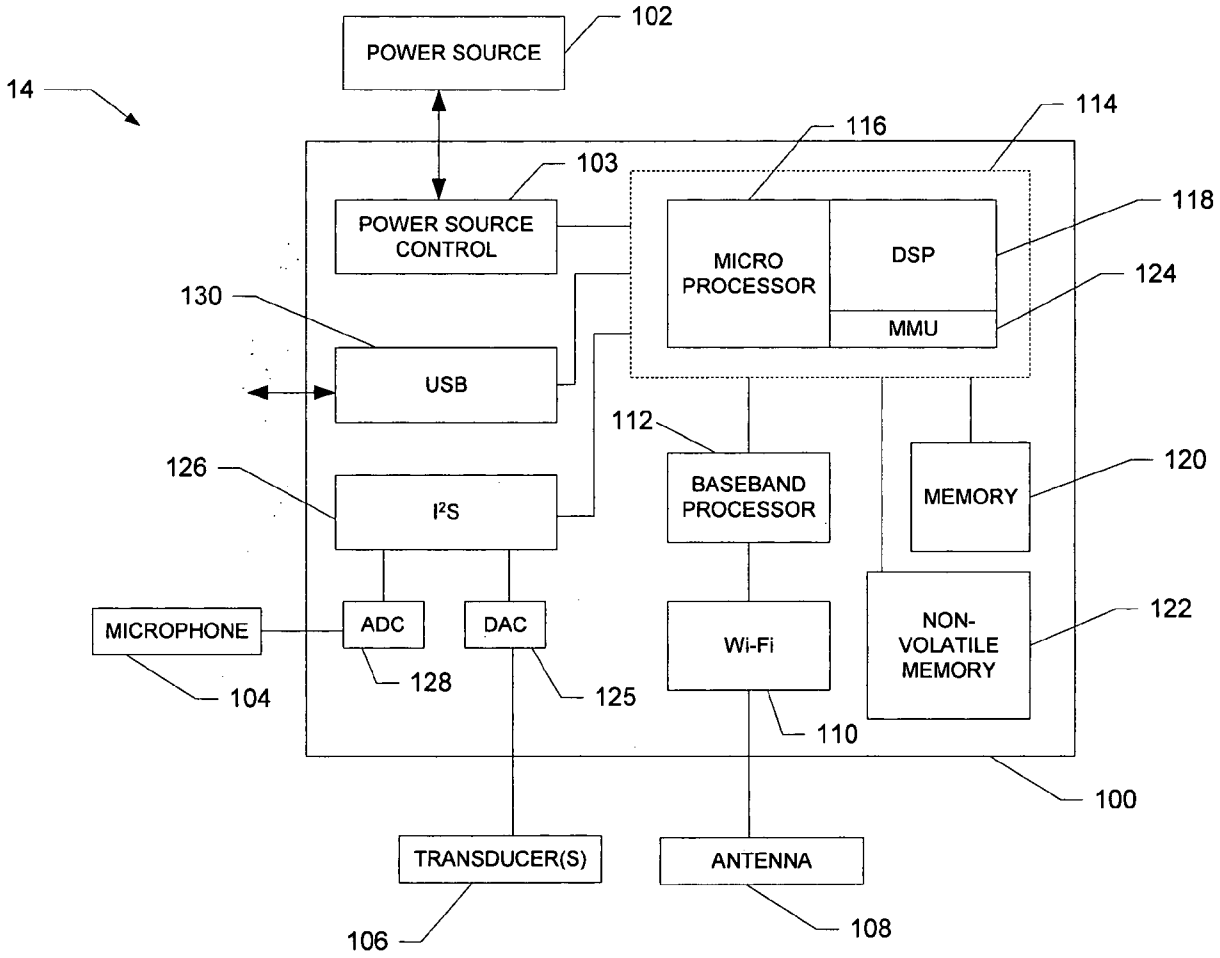

Fig. 3

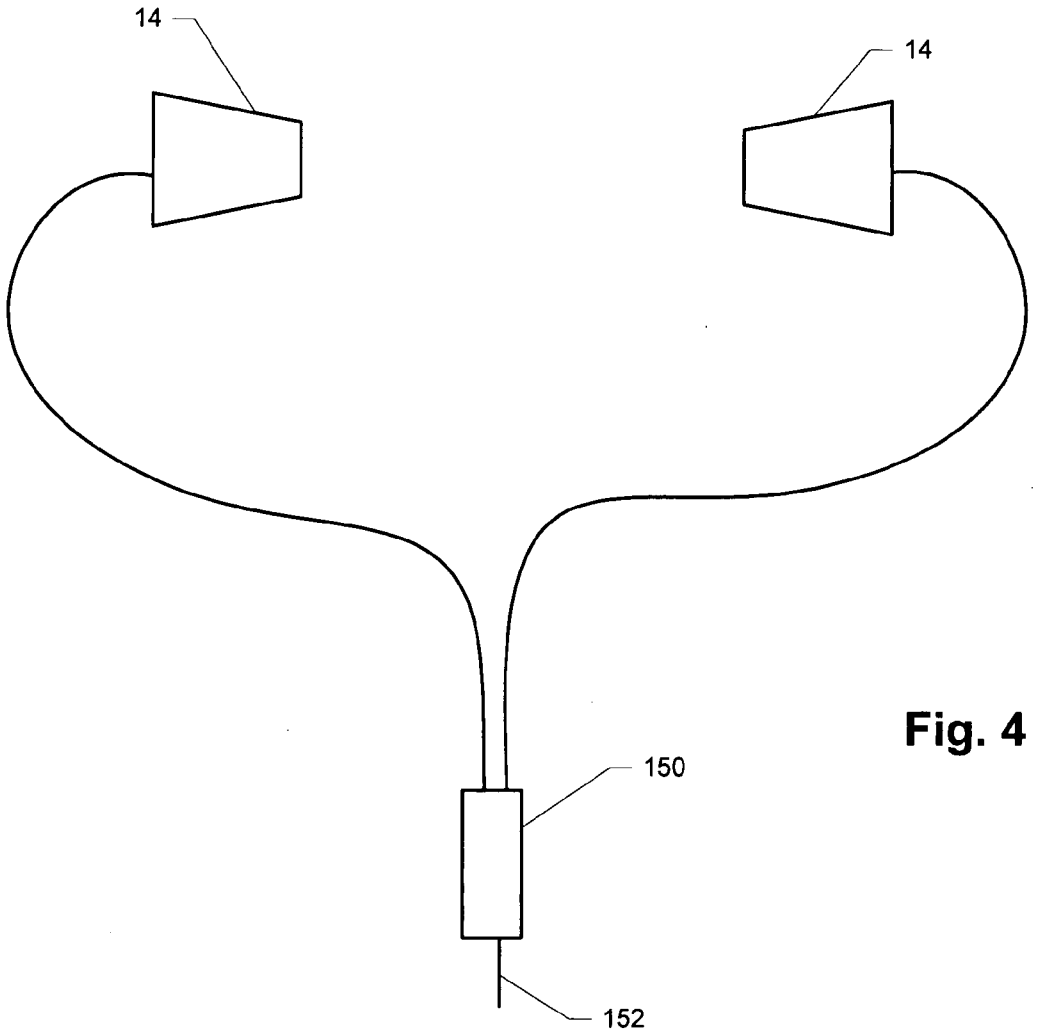

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 09/39754

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - H04R 1/02 (2009.01)
USPC - 381/330
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
USPC: 381/330

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 381/309, 330; 340/505; 709/250 (see terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST(PGPB,USPT,USOC,EPAB,JPAB); GOOGLE SCHOLAR
Search terms: ad hoc wireless network, infrastructure wireless network, earphone, headset, digital audio, antenna, transceiver, server, streaming, web page

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/0116316 A1 (Goldberg) 24 May 2007 (24.05.2007), entire document, especially; para [0095]-[0194], [0222], [0262]-[0277], [0303]-[0328], [0350]-[0352], Fig. 1, 13, 12, 29	1 - 47
A	US 2008/0062939 A1 (Horn et al.) 13 March 2008 (13.03.2008), entire document	1 - 47
A	US 2005/0198233 A1 (Manchester et al.) 08 September 2005 (08.09.2005), entire document	1 - 47

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 June 2009 (02.06.2009)	11 JUN 2009
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/210 (second sheet) (April 2007)

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
15 October 2009 (15.10.2009)

PCT

(10) International Publication Number
WO 2009/126614 A1

(51) International Patent Classification:
H04R 1/02 (2006.01)

(21) International Application Number:
PCT/US2009/039754

(22) International Filing Date:
7 April 2009 (07.04.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/123,265 7 April 2008 (07.04.2008) US

(71) Applicant *(for all designated States except US)*: **KOSS CORPORATION** [US/US]; 4129 North Port Washington Avenue, Milwaukee, WI 53212 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **PELLAND, Michael, J.** [US/US]; N 4626 Wildwood Lane, Princeton, WI 54968-8738 (US). **KOSS, Michael, J.** [US/US]; 2800 West Bradley Road, Milwaukee, WI 53217 (US). **SAGAN, Michael** [US/US]; 598 Woodberry Street, Marshall, WI 53559 (US). **RECKAMP, Steven** [US/US]; 1158 Atcheson Avenue, Sun Prairie, WI 53590-3812 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

[Continued on next page]

(54) **Title**: WIRELESS EARPHONE THAT TRANSITIONS BETWEEN WIRELESS NETWORKS

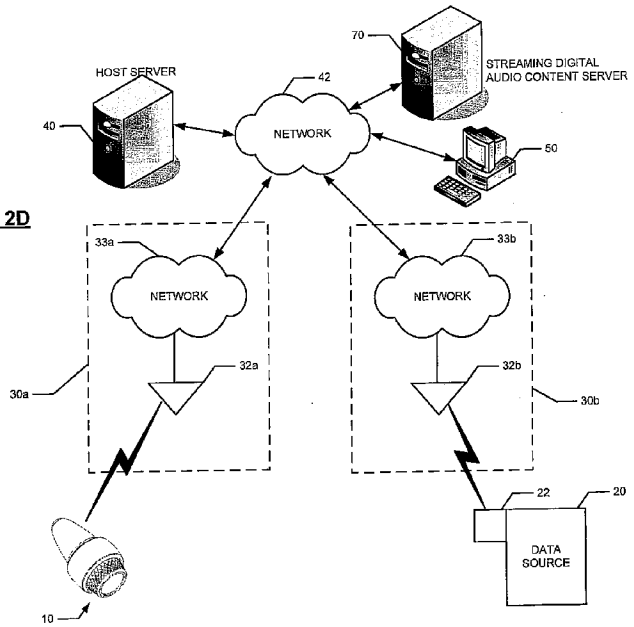

Fig. 2D

(57) **Abstract**: A wireless earphone that comprises a transceiver circuit for receiving streaming audio from a data source over a local ad hoc wireless network. When the data source and the earphone are out of range, they transition automatically to an infrastructure wireless network. If there is no common infrastructure wireless network for both the data source and the speakerphone set, the earphone connects t a host server via an available wireless network.

WO 2009/126614 A1

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

— *with international search report (Art. 21(3))*

WIRELESS EARPHONE THAT TRANSITIONS BETWEEN WIRELESS NETWORKS

Inventors: Michael J. Pelland, Michael J. Koss, Michael Sagan,
Steven Reckamp, Greg Hollingstad, Jeff Bovee, and Morgan Lowery

PRIORITY CLAIM

The present application claims priority to United States provisional application serial number 61/123,265, filed April 7, 2008, which is incorporated herein by reference.

BACKGROUND

Digital audio players, such as MP3 players and iPods, that store and play digital audio files, are very popular. Such devices typically comprise a data storage unit for storing and playing the digital audio, and a headphone set that connects to the data storage unit, usually with a ¼" or a 3.5 mm jack and associated cord. Often the headphones are in-ear type headphones. The cord, however, between the headphones and the data storage unit can be cumbersome and annoying to users, and the length of the cord limits the physical distance between the data storage unit and the headphones. Accordingly, some cordless headphones have been proposed, such as the Monster iFreePlay cordless headphones from Apple Inc., which include a docking port on one of the earphones that can connect directly to an iPod Shuffle. Because they have the docking port, however, the Monster iFreePlay cordless headphones from Apple are quite large and are not in-ear type phones. Recently, cordless headphones that connect wirelessly via IEEE 802.11 to a WLAN-ready laptop or personal computer (PC) have been proposed, but such headphones are also quite large and not in-ear type phones.

SUMMARY

In one general aspect, the present invention is directed to a wireless earphone that comprises a transceiver circuit for receiving streaming audio from a data source, such as a digital audio player or a computer, over an ad hoc wireless network. When the data source and the earphone are out of range via the ad hoc wireless network, they may transition automatically to a common infrastructure wireless network (e.g., a wireless LAN). If there is no common infrastructure wireless network for both the data source and the earphone, the earphone may connect via an available infrastructure wireless network to a host server. The host server may, for example, broadcast streaming audio to the earphone and/or transmit to the earphone a network address (e.g., an Internet Protocol (IP) address) for a network-connected content server that

streams digital audio. The earphone may then connect to the content server using the IP address. The content server may be an Internet radio server, including, for example, an Internet radio server that broadcasts streaming audio from the data source or some other content.

These and other advantageous, unique aspects of the wireless earphone are described below.

FIGURES

Various embodiments of the present invention are described herein by way of example in conjunction with the following figures, wherein:

Figures 1A-1E are views of a wireless earphone according to various embodiments of the present invention;

Figures 2A-2D illustrate various communication modes for a wireless earphone according to various embodiments of the present invention;

Figure 3 is a block diagram of a wireless earphone according to various embodiments of the present invention;

Figures 4A-4B show the wireless earphone connected to another device according to various embodiments of the present invention;

Figure 5 is a diagram of a process implemented by a host server according to various embodiments of the present invention;

Figure 6 is a diagram of a process implemented by the wireless earphone to transition automatically between wireless networks according to various embodiments of the present invention;

Figures 7, 8 and 10 illustrate communication systems involving the wireless earphone according to various embodiments of the present invention;

Figure 9 is a diagram of a headset including a wireless earphone and a microphone according to various embodiments of the present invention; and

Figure 11 is a diagram of a pair of wireless earphones with a dongle according to various embodiments of the present invention.

DESCRIPTION

In one general aspect, the present invention is directed to a wireless earphone that receives streaming audio data via ad hoc wireless networks and infrastructure wireless networks, and that transitions seamlessly between wireless networks. The earphone may comprise one or more in-ear, on-ear, or over-ear speaker elements. Two exemplary in-ear earphone shapes for the wireless earphone 10 are shown in Figures 1A and 1B, respectively, although in other embodiments the

earphone may take different shapes and the exemplary shapes shown in Figures 1A and 1B are not intended to be limiting. In one embodiment, the earphone transitions automatically and seamlessly, without user intervention, between communication modes. That is, the earphone may transition automatically from an ad hoc wireless network to an infrastructure wireless network, without user intervention. As used herein, an "ad hoc wireless network" is a network where two (or more) wireless-capable devices, such as the earphone and a data source, communicate directly and wirelessly, without using an access point. An "infrastructure wireless network," on the other hand, is a wireless network that uses one or more access points to allow a wireless-capable device, such as the wireless earphone, to connect to a computer network, such as a LAN or WAN (including the Internet).

Figures 1A and 1B show example configurations for a wireless earphone 10 according to various embodiments of the present invention. The examples shown in Figures 1A and 1B are not limiting and other configurations are within the scope of the present invention. As shown in Figures 1A and 1B, the earphone 10 may comprise a body 12. The body 12 may comprise an ear canal portion 14 that is inserted in the ear canal of the user of the earphone 10. In various embodiments, the body 12 also may comprise an exterior portion 15 that is not inserted into user's ear canal. The exterior portion 15 may comprise a knob 16 or some other user control (such as a dial, a pressure-activated switch, lever, etc.) for adjusting the shape of the ear canal portion 14. That is, in various embodiments, activation (e.g. rotation) of the knob 16 may cause the ear canal portion 14 to change shape so as to, for example, radially expand to fit snugly against all sides of the user's ear canal. Further details regarding such a shape-changing earbud earphone are described in application PCT/US08/88656, filed 31 December 2008, entitled "Adjustable Shape Earphone," which is incorporated herein by reference in its entirety. The earphone 10 also may comprise a transceiver circuit housed within the body 12. The transceiver circuit, described further below, may transmit and receive the wireless signals, including receive streaming audio for playing by the earphone 10. The transceiver circuit may be housed in the exterior portion 15 of the earphone 10 and/or in the ear canal portion 14.

Although the example earphones 10 shown in Figures 1A and 1B include a knob 16 for adjusting the shape of the ear canal portion 14, the present invention is not so limited, and in other embodiments, different means besides a knob 16 may be used to adjust the ear canal portion 14. In addition, in other embodiments, the earphone 10 may not comprise a shape-changing ear canal portion 14.

In various embodiments, the user may wear two discrete wireless earphones 10: one in each ear. In such embodiments, each earphone 10 may comprise a transceiver circuit. In such

embodiments, the earphones 10 may be connected by a string or some other cord-type connector to keep the earphones 10 from being separated.

In other embodiments, as shown in Figure 1C, a headband 19 may connect the two (left and right) earphones 10. The headband 19 may be an over-the-head band, as shown in the example of Figure 1C, or the headband may be a behind-the-head band. In embodiments comprising a headband 19, each earphone 10 may comprise a transceiver circuit; hence, each earphone 10 may receive and transmit separately the wireless communication signals. In other embodiments comprising a headband 19, only one earphone 10 may comprise the transceiver circuit, and a wire may run along the headband 19 to the other earphone 10 to connect thereby the transceiver circuit to the acoustic transducer in the earphone that does not comprise the transceiver circuit. The embodiment shown in Figure 1C comprises on-ear earphones 10; in other embodiments, in-ear or over-ear earphones may be used.

In other embodiments, the earphone 10 may comprise a hanger bar 17 that allows the earphone 10 to clip to, or hang on, the user's ear, as shown in the illustrated embodiment of Figures 1D-1E. Figure 1D is a perspective view of the earphone and Figure 1E is a side view according to one embodiment. As shown in the illustrated embodiment, the earphone 10 may comprise dual speaker elements 106-A, 106-B. One of the speaker elements (the smaller one) 106-A is sized to fit into the cavum concha of the listener's ear and the other element (the larger one) 106-B is not. The listener may use the hanger bar to position the earphone on the listener's ear. In that connection, the hanger bar may comprise a horizontal section that rests upon the upper external curvature of the listener's ear behind the upper portion of the auricula (or pinna). The earphone may comprise a knurled knob that allows the user to adjust finely the distance between the horizontal section of the hanger bar and the speaker elements, thereby providing, in such embodiments, another measure of adjustability for the user. More details regarding such a dual element, adjustable earphone may be found in United States provisional patent application Serial No. 61/054,238, which is incorporated herein by reference in its entirety.

Figures 2A-2D illustrate various communication modes for a wireless data communication system involving the earphone 10 according to embodiments of the present invention. As shown in Figure 2A, the system comprises a data source 20 in communication with the earphone 10 via an ad hoc wireless network 24. The earphone 10, via its transceiver circuit (described in more detail below), may communicate wirelessly with a data source 20, which may comprise a wireless network adapter 22 for transmitting the digital audio wirelessly. For example, the data source 20 may be a digital audio player (DAP), such as an mp3 player or an iPod, or any other suitable digital audio playing device, such as a laptop or personal computer, that stores and/or plays digital

audio files. In other embodiments, the data source 20 may generate analog audio, and the wireless network adapter 22 may encode the analog audio into digital format for transmission to the earphone 10.

The wireless network adapter 22 may be an integral part of the data source 20, or it may be a separate device that is connected to the data source 20 to provide wireless connectivity for the data source 20. For example, the wireless network adapter 22 may comprise a wireless network interface card (WNIC) or other suitable transceiver that plugs into a USB port or other port or jack of the data source 20 (such as a TRS connector) to stream data, e.g., digital audio files, via a wireless network (e.g., the ad hoc wireless network 24 or an infrastructure wireless network). The digital audio transmitted from the data source 20 to the earphone 10 via the wireless networks may comprise compressed or uncompressed audio. Any suitable file format may be used for the audio, including mp3, lossy or lossless WMA, Vorbis, Musepack, FLAC, WAV, AIFF, AU, or any other suitable file format.

When in range, the data source 20 may communicate with the earphone 10 via the ad hoc wireless network 24 using any suitable wireless communication protocol, including Wi-Fi (e.g., IEEE 802.11a/b/g/n), WiMAX (IEEE 802.16), Bluetooth, Zigbee, UWB, or any other suitable wireless communication protocol. For purposes of the description to follow, it is assumed that the data source 20 and the earphone 10 communicate using a Wi-Fi protocol, although the invention is not so limited and other wireless communication protocols may be used in other embodiments of the invention. The data source 20 and the earphone 10 are considered in range for the ad hoc wireless network 24 when the signal strengths (e.g., the RSSI) of the signals received by the two devices are above a threshold minimum signal strength level. For example, the data source 20 and the earphone 10 are likely to be in range for an ad hoc wireless network when then are in close proximity, such as when the wearer of the earphone 10 has the data source 20 on his/her person, such as in a pocket, strapped to their waist or arm, or holding the data source in their hand.

When the earphone 10 and the data source 20 are out of range for the ad hoc wireless network 24, that is, when the received signals degrade below the threshold minimum signal strength level, both the earphone 10 and the data source 20 may transition automatically to communicate over an infrastructure wireless network (such as a wireless LAN (WLAN)) 30 that is in the range of both the earphone 10 and the data source 20, as shown in Figure 2B. The earphone 10 and the data source 20 (e.g., the wireless network adapter 22) may include firmware, as described further below, that cause the components to make the transition to a common infrastructure wireless network 30 automatically and seamlessly, e.g., without user intervention. The earphone 10 may cache the received audio in a buffer or memory for a time period before

playing the audio. The cached audio may be played after the connection over the ad hoc wireless network is lost to give the earphone 10 and the data source 20 time to connect via the infrastructure wireless network.

For example, as shown in Figure 2B, the infrastructure network may comprise an access point 32 that is in the range of both the data source 20 and the earphone 10. The access point 32 may be an electronic hardware device that acts as a wireless access point for, and that is connected to, a wired and/or wireless data communication network 33, such as a LAN or WAN, for example. The data source 20 and the earphone 10 may both communicate wirelessly with the access point 32 using the appropriate network data protocol (a Wi-Fi protocol, for example). The data source 20 and the earphone 10 may both transition automatically to an agreed-upon WLAN 30 that is in the range of both devices when they cannot communicate satisfactorily via the ad hoc wireless network 24. A procedure for specifying an agreed-upon infrastructure wireless network 30 is described further below. Alternatively, the infrastructure wireless network 30 may have multiple access points 32a-b, as shown in Figure 2C. In such an embodiment, the data source 20 may communicate wirelessly with one access point 32b and the earphone 10 may communicate wirelessly with another access point 32a of the same infrastructure wireless network 30. Again, the data source 20 and the earphone 10 may transition to an agreed-upon WLAN.

If there is no suitable common infrastructure wireless network over which the earphone 10 and the data source 20 can communicate, as shown in Fig. 2D, the earphone 10 may transition to communicate with an access point 32a for an available (first) wireless network (e.g., WLAN) 30a that is in the range of the earphone 10. In this mode, the earphone 10 may connect via the wireless network 30a to a network-enabled host server 40. The host server 40 may be connected to the wireless network 30a via an electronic data communication network 42, such as the Internet. In one mode, the host server 40 may transmit streaming digital audio via the networks 33a, 42 to the earphone 10. In another mode, the host server 40 may transmit to the earphone 10 a network address, such as an Internet Protocol (IP) address, for a streaming digital audio content server 70 on the network 42. Using the received IP address, the earphone 10 may connect to the streaming digital audio content server 70 via the networks 30a, 42 to receive and process digital audio from the streaming digital audio content server 70.

The digital audio content server 70 may be, for example, an Internet radio station server. The digital audio content server 70 may stream digital audio over the network 42 (e.g., the Internet), which the earphone 10 may receive and process. In one embodiment, the streaming digital audio content server 70 may stream digital audio received by the streaming digital audio content server 70 from the data source 20. For example, where the data source 20 is a wireless-

capable device, such as a portable DAP, the data source 20 may connect to the streaming digital audio content server 70 via a wireless network 30b and the network 42. Alternatively, where for example the data source 20 is non-wireless-capable device, such as a PC, the data source 20 may have a direct wired connection to the network 42. After being authenticated by the streaming digital audio content server 70, the data source 20 may stream digital audio to the streaming digital audio content server 70, which may broadcast the received digital audio over the network 42 (e.g., the Internet). In such a manner, the user of the earphone 10 may listen to audio from the data source 20 even when (i) the earphone 10 and the data source 20 are not in communication via an ad hoc wireless network 24 and (ii) the earphone 10 and the data source 20 are not in communication via a common local infrastructure wireless network 30.

Figure 3 is a block diagram of the earphone 10 according to various embodiments of the present invention. In the illustrated embodiment, the earphone 10 comprises a transceiver circuit 100 and related peripheral components. As shown in Figure 3, the peripheral components of the earphone 10 may comprise a power source 102, a microphone 104, one or more acoustic transducers 106 (e.g., speakers), and an antenna 108. The transceiver circuit 100 and some of the peripheral components (such as the power source 102 and the acoustic transducers 106) may be housed within the body 12 of the earphone 10 (see Figure 1). Other peripheral components, such as the microphone 104 and the antenna 108 may be external to the body 12 of the earphone 10. In addition, some of the peripheral components, such as the microphone 104, are optional in various embodiments.

In various embodiments, the transceiver circuit 100 may be implemented as a single integrated circuit (IC), such as a system-on-chip (SoC), which is conducive to miniaturizing the components of the earphone 10, which is advantageous if the earphone 10 is to be relatively small in size, such as an in-ear earphone (see Figures 1A-1B for example). In alternative embodiments, however, the components of the transceiver circuit 100 could be realized with two or more discrete ICs or other components, such as separate ICs for the processors, memory, and RF (e.g., Wi-Fi) module, for example.

The power source 102 may comprise, for example, a rechargeable or non-rechargeable battery (or batteries). In other embodiments, the power source 102 may comprise one or more ultracapacitors (sometimes referred to as supercapacitors) that are charged by a primary power source. In embodiments where the power source 102 comprises a rechargeable battery cell or an ultracapacitor, the battery cell or ultracapacitor, as the case may be, may be charged for use, for example, when the earphone 10 is connected to a docking station or computer. The docking station may be connected to or part of a computer device, such as a laptop computer or PC. In

addition to charging the rechargeable power source 102, the docking station and/or computer may facilitate downloading of data to and/or from the earphone 10. In other embodiments, the power source 102 may comprise capacitors passively charged with RF radiation, such as described in U.S. Patent No. 7,027,311. The power source 102 may be coupled to a power source control module 103 of transceiver circuit 100 that controls and monitors the power source 102.

The acoustic transducer(s) 106 may be the speaker element(s) for conveying the sound to the user of the earphone 10. According to various embodiments, the earphone 10 may comprise one or more acoustic transducers 106. For embodiments having more than one transducer, one transducer may be larger than the other transducer, and a crossover circuit (not shown) may transmit the higher frequencies to the smaller transducer and may transmit the lower frequencies to the larger transducer. More details regarding dual element earphones are provided in U.S. Patent 5,333,206, assigned to Koss Corporation, which is incorporated herein by reference in its entirety.

The antenna 108 may receive and transmit the wireless signals from and to the wireless networks 24, 30. A RF (e.g., Wi-Fi) module 110 of the transceiver circuit 100 in communication with the antenna 108 may, among other things, modulate and demodulate the signals transmitted from and received by the antenna 108. The RF module 110 communicates with a baseband processor 112, which performs other functions necessary for the earphone 10 to communicate using the Wi-Fi (or other communication) protocol.

The baseband processor 112 may be in communication with a processor unit 114, which may comprise a microprocessor 116 and a digital signal processor (DSP) 118. The microprocessor 116 may control the various components of the transceiver circuit 100. The DSP 114 may, for example, perform various sound quality enhancements to the digital audio received by the baseband processor 112, including noise cancellation and sound equalization. The processor unit 114 may be in communication with a volatile memory unit 120 and a non-volatile memory unit 122. A memory management unit 124 may control the processor unit's access to the memory units 120, 122. The volatile memory 122 may comprise, for example, a random access memory (RAM) circuit. The non-volatile memory unit 122 may comprise a read only memory (ROM) and/or flash memory circuits. The memory units 120, 122 may store firmware that is executed by the processor unit 114. Execution of the firmware by the processor unit 114 may provide various functionality for the earphone 10, such as the automatic transition between wireless networks as described herein. The memory units 120, 122 may also cache received digital audio.

A digital-to-analog converter (DAC) 125 may convert the digital audio from the processor unit 114 to analog form for coupling to the acoustic transducer(s) 106. An I^2S interface 126 or other suitable serial or parallel bus interface may provide the interface between the processor unit 114 and the DAC 125. An analog-to-digital converter (ADC) 128, which also communicates with the I^2S interface 126, may convert analog audio signals picked up by the microphone 104 for processing by the processor unit 114.

The transceiver circuit 100 also may comprise a USB or other suitable interface 130 that allows the earphone 10 to be connected to an external device via a USB cable or other suitable link. As shown in Figure 4A, the external device may be a docking station 200 connected to a computer device 202. Also, in various embodiments, the earphone 10 could be connected directly to the computer 202 without the docking station 200. In addition, the external device may be a DAP 210, as shown in Figure 4B. In that way, the earphone 10 could connect directly to a data source 20, such as the DAP 210 or the computer 202, through the USB port 130. In addition, through the USB port 130, the earphone 10 may connect to a PC 202 or docking station 202 to charge up the power source 102 and/or to get downloads (e.g., data or firmware).

According to various embodiments, the earphone 10 may have an associated web page that a user may access through the host server 40 (see Figure 2D) or some other server. An authenticated user could log onto the website from a client computing device 50 (e.g., laptop, PC, handheld computer device, etc., including the data source 20) (see Figure 2D) to access the web page for the earphone 10 to set various profile values for the earphone 10. For example, at the web site, the user could set various content features and filters, as well as adjust various sound control features, such as treble, bass, frequency settings, noise cancellation settings, etc. In addition, the user could set preferred streaming audio stations, such as preferred Internet radio stations or other streaming audio broadcasts. That way, instead of listening to streaming audio from the data source 20, the user could listen to Internet radio stations or other streaming audio broadcasts received by the earphone 10. In such an operating mode, the earphone user, via the web site, may prioritize a number of Internet radio stations or other broadcast sources (hosted by streaming digital audio content servers 70). With reference to Figure 7, the host server 40 may send the IP address for the earphone user's desired (e.g., highest priority) Internet radio station to the earphone 10. A button 11 on the earphone 10, such as on the rotating dial 16 as shown in the examples of Figures 1A and 1B, may allow the user to cycle through the preset preferred Internet radio stations. That is, for example, when the user presses the button 11, an electronic communication may be transmitted to the host server 40 via the wireless network 30, and in response to receiving the communication, the host server 40 may send the IP address for the

user's next highest rated Internet radio station via the network 42 to the earphone 10. The earphone 10 may then connect to the streaming digital audio content server 70 for that Internet radio station using the IP address provided by the host server 40. This process may be repeated, e.g., cycled through, for each preset Internet radio station configured by the user of the earphone 10.

At the web site for the earphone 10 hosted on the host server 40, in addition to establishing the identification of digital audio sources (e.g., IDs for the user's DAP or PC) and earphones, the user could set parental or other user controls. For example, the user could restrict certain Internet radio broadcasts based on content or parental ratings, etc. That is, for example, the user could configure a setting through the web site that prevents the host server 40 from sending an IP address for a streaming digital audio content server 70 that broadcasts explicit content based on a rating for the content. In addition, if a number of different earphones 10 are registered to the same user, the user could define separate controls for the different earphones 10 (as well as customize any other preferences or settings particular to the earphones 10, including Internet radio stations, sound quality settings, etc. that would later be downloaded to the earphones 10). In addition, in modes where the host server 40 streams audio to the earphone 10, the host server 40 may log the files or content streamed to the various earphones 10, and the user could view at the web site the files or content that were played by the earphones 10. In that way, the user could monitor the files played by the earphones 10.

In addition, the host server 40 may provide a so-called eavesdropping function according to various embodiments. The eavesdropping service could be activated via the web site. When the service is activated, the host server 40 may transmit the content that it is delivering to a first earphone 10a to another, second earphone 10b, as shown in Figure 8. Alternatively, the host server 40 may transmit to the second earphone 10b the most recent IP address for a streaming digital audio content server 70 that was sent to the first earphone 10a. The second earphone 10b may then connect to the streaming digital audio content server 70 that the first earphone 10a is currently connected. That way, the user of the second earphone 10b, which may be a parent, for example, may directly monitor the content being received by the first earphone 10a, which may belong to a child of the parent.

This function also could be present in the earphones 10 themselves, allowing a parent (or other user) to join an ad-hoc wireless network and listen to what their child (or other listener) is hearing. For example, with reference to Figure 10, a first earphone 10a may receive wireless audio, such as from the data source 20 or some other source, such as the host server 40. The first earphone 10a may be programmed with firmware to broadcast the received audio to a second

earphone 10b via an ad hoc wireless network 24. That way, the wearer of the second earphone 10b can monitor in real-time the content being played by the first earphone 10a.

At the web site, the user may also specify the identification number ("ID") of their earphone(s) 10, and the host server 40 may translate the ID to the current internet protocol (IP) addresses for the earphone 10 and for the data source 20. This allows the user to find his or her data source 20 even when it is behind a firewall or on a changing IP address. That way, the host server 40 can match the audio from the data source 20 to the appropriate earphone 10 based on the specified device ID. The user also could specify a number of different data sources 20. For example, the user's DAP may have one specified IP address and the user's home (or work) computer may have another specified IP address. Via the web site hosted by the host server 40, the user could specify or prioritize from which source (e.g., the user's DAP or computer) the earphone 10 is to receive content.

The host server 40 (or some other server) may also push firmware upgrades and/or data updates to the earphone 10 using the IP addresses of the earphone 10 via the networks 30, 42. In addition, a user could download the firmware upgrades and/or data updates from the host server 40 to the client computing device 202 (see Figure 4A) via the Internet, and then download the firmware upgrades and/or data updates to the earphone 10 when the earphone 10 is connected to the client computer device 202 (such as through a USB port and/or the docking station 200).

Whether the downloads are transmitted wirelessly to the earphone 10 or via the client computing device 202 may depend on the current data rate of the earphone 10 and the quantity of data to be transmitted to the earphone 10. For example, according to various embodiments, as shown in the process flow of Figure 5, the host server 40 may be programmed, at step 50, to make a determination, based on the current data rate for the earphone 10 and the size of the update, whether the update should be pushed to the earphone 10 wirelessly (e.g., via the WLAN 30a in Figure 2D). If the update is too large and/or the current data rate is too low that the performance of the earphone 10 will be adversely affected, the host server 40 may refrain from pushing the update to the earphone 10 wirelessly and wait instead to download the update to the client computing device 202 at step 51. Conversely, if the host server 40 determines that, given the size of the update and the current data rate for the earphone 10 that the performance of the earphone 10 will not be adversely affected, the host server 40 may transmit the update wirelessly to the earphone 10 at step 52.

As mentioned above, the processor unit 114 of the speakerphones 14 may be programmed, via firmware stored in the memory 120, 122, to have the ability to transition automatically from the ad hoc wireless network 24 to an infrastructure wireless network 30 (such as a WLAN) when

the quality of the signal on the ad hoc wireless network 24 degrades below a suitable threshold (such as when the data source 20 is out of range for an ad hoc wireless network). In that case, the earphone 10 and the data source 20 may connect to a common infrastructure wireless network (e.g., WLAN) (see, for example, Figures 2B-2C). Through the web site for the earphone 10, described above, the user could specify a priority of infrastructure wireless networks 30 for the data source 20 and the earphone 10 to connect to when the ad hoc wireless network 24 is not available. For example, the user could specify a WLAN servicing his/her residence first, a WLAN servicing his/her place of employment second, etc. During the time that the earphone 10 and the data source 20 are connected via the ad hoc wireless network 24, the earphone 10 and the data source 20 may exchange data regarding which infrastructure networks are in range. When the earphone 10 and the data source 20 are no longer in range for the ad hoc wireless network 24 (that is, for example, the signals between the device degrade below an acceptable level), they may both transition automatically to the highest prioritized infrastructure wireless network whose signal strength is above a certain threshold level. That way, even though the earphone 10 and the data source 20 are out of range for the ad hoc wireless network 24, the earphone 10 may still receive the streaming audio from the data source 20 via the infrastructure wireless network 30 (see Figs. 2B-2C).

When none of the preferred infrastructure networks is in range, the earphone 10 may connect automatically to the host server 40 via an available infrastructure wireless network 30 (see Fig. 2D), e.g., the infrastructure wireless network 30 having the highest RSSI and to which the earphone 10 is authenticated to use. The host server 40, as mentioned above, may transmit IP addresses to the earphone 10 for streaming digital audio content servers 70 or the host sever 40 may stream digital audio to the earphone 10 itself when in this communication mode.

Figure 6 is a diagram of the process flow, according to one embodiment, implemented by the transceiver circuit 100 of the earphone 10. The process shown in Figure 6 may be implemented in part by the processor unit 114 executing firmware stored in a memory unit 120, 122 of the transceiver circuit 100. At step 61, the earphone 10 may determine if it can communicate with the data source 20 via an ad hoc wireless network 24. That is, the earphone 10 may determine if the strength of the wireless signals from the data source 20 exceed some minimum threshold. If so, the data source 20 and the earphone 10 may communicate wirelessly via the ad hoc wireless network 24 (see Figure 2A). While in this communication mode, at step 62, the data source 20 and the earphone 10 also may exchange data regarding the local infrastructure wireless networks, if any, in the range of the data source 20 and the earphone 10, respectively. For example, the earphone 10 may transmit the ID of local infrastructure wireless

networks 30 that the earphone 10 can detect whose signal strength (e.g., RSSI) exceeds some minimum threshold level. Similarly, the data source 20 may transmit the ID the local infrastructure wireless networks 30 that the data source 20 can detect whose signal strength (e.g., RSSI) exceeds some minimum threshold level. The earphone 10 may save this data in a memory unit 120, 122. Similarly, the data source 20 may store in memory the wireless networks that the earphone 10 is detected.

The data source 20 and the earphone 10 may continue to communicate via the ad hoc wireless network mode 24 until they are out of range (e.g., the signal strengths degrade below a minimum threshold level). If an ad hoc wireless network 24 is not available at block 61, the transceiver circuit 100 and the data source 20 may execute a process, shown at block 63, to connect to the user's highest prioritized infrastructure wireless network 30. For example, of the infrastructure wireless networks whose signal strength exceeded the minimum threshold for both the earphone 10 and the data source 20 determined at step 62, the earphone 10 and the data source 20 may both transition to the infrastructure wireless network 30 having the highest priority, as previously set by the user (seen Figures 2B-2C, for example). For example, if the user's highest prioritized infrastructure wireless network 30 is not available, but the user's second highest prioritized infrastructure wireless network 30 is, the earphone 10 and the data source 20 may both transition automatically to the user's second highest prioritized infrastructure wireless network 30 at block 64. As shown by the loop with block 65, the earphone 10 and the data source 20 may continue to communicate via one of the user's prioritized infrastructure wireless networks 30 as long as the infrastructure wireless network 30 is available. If the infrastructure wireless network becomes unavailable, the process may return to block 61.

If, however, no ad hoc wireless network and none of the user's prioritized infrastructure wireless networks are available, the earphone 10 may transition automatically to connect to the host server 40 at block 66 (see Figure 2D) using an available infrastructure wireless network 30. At block 67, the host server 40 may transmit an IP address to the earphone 10 for one of the streaming digital audio content servers 70, and at block 68 the earphone 10 may connect to the streaming digital audio content server 70 using the received IP address. At step 69, as long as the earphone 10 is connected to the streaming digital audio content server 70, the earphone 10 may continue to communicate in this mode. However, if the earphone 10 loses its connection to the digital audio content server 70, the process may return to block 61 in one embodiment. As mentioned above, at block 67, instead of sending an IP address for a streaming digital audio content server 70, the host server 40 may stream digital audio to the earphone 10. The user, when configuring their earphone 10 preferences via the web site, may specify and/or prioritize whether

the host server 40 is to send IP addresses for the streaming digital audio content servers 70 and/or whether the host server 40 is to stream audio to the earphone 10 itself.

In another embodiment, the earphone 10 may be programmed to transition automatically to the host server 40 when the earphone 10 and the data source 20 are not in communication via the ad hoc wireless network 24. That is, in such an embodiment, the earphone 10 may not try to connect via a local infrastructure wireless network 30 with the data source 20, but instead transition automatically to connect to the host server 40 (see Figure 2D).

In various embodiments, as shown in Figure 1B, the button 11 or other user selection device that allows the wearer of the earphone 10 to indicate approval and/or disapproval of songs or other audio files listened to by the wearer over an Internet radio station. The approval/disapproval rating, along with metadata for the song received by the earphone 10 with the streaming audio, may be transmitted from the transceiver circuit 100 of the earphone 10 back to the host server 40, which may log the songs played as well as the ratings for the various songs/audio files. In addition to being able to view the logs at the website, the host server 40 (or some other server) may send an email or other electronic communication to the earphone user, at a user specified email address or other address, which the user might access from their client communication device 50 (see Figure 2D). The email or other electronic communication may contain a listing of the song/audio files for which the user gave approval ratings using the button 11 or other user selection device. Further, the email or other electronic communication may provide a URL link for a URL at which the user could download song/audio files that the user rated (presumably song/audio files for which the user gave an approval rating). In some instances, the user may be required to pay a fee to download the song/audio file.

The user song ratings also may be used by the host server 40 to determine the user's musical preferences and offer new music that the user might enjoy. More details about generating user play lists based on song ratings may be found in published U.S. patent applications Pub. No. 2006/0212444, Pub. No. 2006/0206487, and Pub. No. 2006/0212442, and U.S. Patent 7,003,515, which are incorporated herein by reference in their entirety.

In addition or alternatively, the user could log onto a web site hosted by the host server 40 (or some other server) to view the approval/disapproval ratings that the user made via the button 11 on the earphone 10. The web site may provide the user with the option of downloading the rated songs/audio files (for the host server 40 or some other server system) to their client computer device 50. The user could then have their earphone 10 connect to their client computer device 50 as a data source 20 via an ad hoc wireless network 24 (see Figure 2A) or via an infrastructure wireless network (see Figures 2B-2D) to listen to the downloaded songs. In

addition, the user could download the song files from their client computer device 50 to their DAP and listen to the downloaded song files from their DAP by using their DAP as the data source 20 in a similar manner.

Another application of the headsets may be in vehicles equipped with Wi-Fi or other wireless network connectivity. Published PCT application WO 2007/136620, which is incorporated herein by reference, discloses a wireless router for providing a Wi-Fi or other local wireless network for a vehicle, such as a car, truck, boat, bus, etc. In a vehicle having a Wi-Fi or other local wireless network, the audio for other media systems in the vehicle could be broadcast over the vehicle's wireless network. For example, if the vehicle comprises a DVD player, the audio from the DVD system could be transmitted to the router and broadcast over the vehicle's network. Similarly, the audio from terrestrial radio stations, a CD player, or an audio cassette player could be broadcast over the vehicle's local wireless network. The vehicle's passengers, equipped with the earphones 10, could cycle through the various audio broadcasts (including the broadcasts from the vehicle's media system as well as broadcasts from the host server 40, for example) using a selection button 11 on the earphone 10. The vehicle may also be equipped with a console or terminal, etc., through which a passenger could mute all of the broadcasts for direct voice communications, for example.

As described above, the earphones 10 may also include a microphone 104, as shown in the example of Figure 9. The headset 90 shown in Figure 9 includes two earphones 10, both of which may include a transceiver circuit 100 or only one of which may include the transceiver circuit, as discussed above. The microphone 104 could be used to broadcast communications from one earphone wearer to another earphone wearer. For example, one wearer could activate the microphone by pressing a button 92 on the headset 90. The headset 90 may then transmit a communication via an ad hoc wireless network 24 or other wireless network to a nearby recipient (or recipients) equipped with a headset 90 with a transceiver circuit 100 in one or both of the earphones 10. When such communication is detected by the recipient's headset 90, the streaming audio received over the wireless network by the recipient's headset 90 may be muted, and the intercom channel may be routed to the transducer(s) of the recipient's headset 90 for playing for the recipient. This functionality may be valuable and useful where multiple wearers of the headsets 90 are in close proximity, such as on motorcycles, for example.

Another exemplary use of the earphones 10 is in a factory, warehouse, construction site, or other environment that might be noisy. Persons (e.g., workers) in the environment could use the earphones 10 for protection from the surrounding noise of the environment. From a console or terminal, a person (e.g., a supervisor) could select a particular recipient for a communication over

the Wi-Fi network (or other local wireless network). The console or terminal may have buttons, dials, or switches, etc., for each user/recipient, or it could have one button or dial through which the sender could cycle through the possible recipients. In addition, the console or terminal could have a graphical user interface, through which the sender may select the desired recipient(s).

As mentioned above, the earphones 10 may comprise a USB port. In one embodiment, as shown in Figure 11, the user may use an adapter 150 that connects to the USB port of each earphone 10. The adapter 150 may also have a plug connector 152, such as a 3.5 mm jack, which allows the user to connect the adapter 150 to devices having a corresponding port for the connector 152. When the earphones 10 detect a connection via their USB interfaces in such a manner, the Wi-Fi (or other wireless protocol) components may shut down or go into sleep mode, and the earphones 10 will route standard headphone level analog signals to the transducer(s) 106. This may be convenient in environments where wireless communications are not permitted, such as airplanes, but where there is a convenient source of audio contact. For example, the adapter 150 could plug into a person's DAP. The DSP 118 of the earphone 10 may still be operational in such a non-wireless mode to provide noise cancellation and any applicable equalization.

The examples presented herein are intended to illustrate potential and specific implementations of the embodiments. It can be appreciated that the examples are intended primarily for purposes of illustration for those skilled in the art. No particular aspect of the examples is/are intended to limit the scope of the described embodiments.

According to various embodiments, therefore, the present invention is directed to an earphone 10 that comprises a body 12, where the body 12 comprises: (i) at least one acoustic transducer 106 for converting an electrical signal to sound; (ii) an antenna 108; and (iii) a transceiver circuit 100 in communication with the at least one acoustic transducer 106 and the antenna 108. The transceiver circuit 100 is for receiving and transmitting wireless signals via the antenna 108, and the transceiver circuit 100 is for outputting the electrical signal to the at least one acoustic transducer 106. The wireless transceiver circuit also comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to: (i) receive digital audio wirelessly from a data source 20 via an ad hoc wireless network 24 when the data source 20 is in wireless communication range with the earphone 10 via the ad hoc wireless network 24; and (ii) when the data source 20 is not in wireless communication range with the earphone 10 via the ad hoc wireless network 24, transition automatically to receive digital audio via an infrastructure wireless network 30.

According to various implementations, the data source may comprise a portable digital audio player, such as an MP3 player, iPod, or laptop computer, or a nonportable digital audio

player, such as a personal computer. In addition, the transceiver circuit 100 may comprise: (i) a wireless communication module 110 (such as a Wi-Fi or other wireless communication protocol module); (ii) a processor unit 114 in communication with the wireless communication module 110; (iii) a non-volatile memory unit 122 in communication with the processor unit 114; and (iv) a volatile memory 120 unit in communication with the processor unit 114. The infrastructure wireless network may comprise a WLAN. The transceiver circuit 100 may receive digital audio from the data source 20 via the infrastructure wireless network 30 when the data source 20 is not in wireless communication range with the earphone 10 via the ad hoc wireless network 24. The transceiver circuit firmware, when executed by the transceiver circuit 100, may cause the transceiver circuit 100 of the earphone 10 to transition automatically to a pre-set infrastructure wireless network 30 that the data source 20 transitions to when the data source 20 is not in wireless communication range with the earphone 10 via the ad hoc wireless network 24 and when the pre-set infrastructure wireless network 30 is in range of both the earphone 10 and the data source 20. In addition, the transceiver circuit firmware, when executed by the transceiver circuit 100, may cause the transceiver circuit 100 of the earphone 10 to transmit data via the ad hoc wireless network 24 to the data source 20 regarding one or more infrastructure wireless networks 30 detected by the transceiver circuit 100 when the earphone 10 and the data source 20 are communicating via the ad hoc wireless network 24.

In addition, the transceiver circuit firmware, when executed by the transceiver circuit 100, may cause the transceiver circuit 100 of the earphone 10 to connect to a host server 40 via an available infrastructure wireless network 30 when the data source 20 is not in wireless communication range with the earphone 10 via the ad hoc wireless network 24. The earphone 10 may receive streaming digital audio from the host server 40 via the infrastructure wireless network 30. In addition, the earphone 10 may receive a first network address for a first streaming digital audio content server 70 from the host server 40 via the infrastructure wireless network 30. In addition, the earphone 10 may comprise a user control, such as button 11, dial, pressure switch, or other type of user control, that, when activated, causes the earphone 10 to transmit an electronic request via the infrastructure wireless network 30 to the host server 40 for a second network address for a second streaming digital audio content server 70.

In other embodiments, the present invention is directed to a system that comprises: (i) a data source 20 for wirelessly transmitting streaming digital audio; and (ii) a wireless earphone 10 that is in wireless communication with the data source 20. In yet other embodiments, the present invention is directed to a communication system that comprises: (i) a host server 40; (ii) a first streaming digital audio content server 70 that is connected to the host server 40 via a data network

42; and (iii) a wireless earphone 10 that is in communication with the host server 40 via a wireless network 30. The host server 40 is programmed to transmit to the earphone 10 a first network address for the first streaming digital audio content server 70 on the data network 42. The host server 40 and the streaming digital audio content server(s) 70 each may comprise one or more processor circuits and one or more memory circuits (e.g., ROM circuits and/or RAM circuits).

In yet another embodiment, the present invention is directed to a headset that comprises: (i) a first earphone 10a that comprises one or more acoustic transducers 10b for converting a first electrical signal to sound; and (ii) a second earphone 10b, connected to the first earphone 10a, wherein the second earphone 10b comprises one or more acoustic transducers10b for converting a second electrical signal to sound. In one embodiment, the first earphone 10a comprises: (i) a first antenna 108; and (ii) a first transceiver circuit 100 in communication with the one or more acoustic transducers 106 of the first earphone 10a and in communication with the first antenna 108. The first transceiver circuit 100 is for receiving and transmitting wireless signals via the first antenna 108, and for outputting the first electrical signal to the one or more acoustic transducers 10b of the first earphone 10a. The first transceiver circuit 100 also may comprise firmware, which when executed by the first transceiver circuit 100, causes the first transceiver circuit 100 to: (i) receive digital audio wirelessly from a data source 20 via an ad hoc wireless network 24 when the data source 20 is in wireless communication range with the first earphone 10a via the ad hoc wireless network 24; and (ii) when the data source 20 is not in wireless communication range with the first earphone 10a via the ad hoc wireless network 24, transition automatically to receive digital audio via an infrastructure wireless network 30.

In various implementations, the headset further may comprise a head band 19 that is connected to the first and second earphones 10. In addition, the headset 19 further may comprise a microphone 104 having an output connected to the first transceiver circuit 100. In one embodiment, the first transceiver circuit 100 is for outputting the second electrical signal to the one or more acoustic transducers 106 of the second earphone 10b. In another embodiment, the second earphone 10b comprises: (i) a second antenna 108; and (ii) a second transceiver circuit 100 in communication with the one or more acoustic transducers 106 of the second earphone 10b and in communication with the second antenna 108. The second transceiver circuit 100 is for receiving and transmitting wireless signals via the second antenna 108, and for outputting the second electrical signal to the one or more acoustic transducers 106 of the second earphone 10b. The second transceiver circuit 100 may comprise firmware, which when executed by the second transceiver circuit 100, causes the second transceiver circuit 100 to: (i) receive digital audio wirelessly from the data source 20 via the ad hoc wireless network 24 when the data source 20 is

in wireless communication range with the second earphone10b via the ad hoc wireless network 24; and (ii) when the data source 20 is not in wireless communication range with the second earphone 10b via the ad hoc wireless network 24, transition automatically to receive digital audio via the infrastructure wireless network 30.

In addition, according to various embodiments, the first earphone 10a may comprise a first data port and the second earphone 10b may comprise a second data port. In addition, the headset may further comprise an adapter or dongle 150 connected to the first data port of the first earphone 10a and to the second data port of the second earphone 10b, wherein the adapter 150 comprises an output plug connector 152 for connecting to a remote device.

In addition, according to other embodiments, the present invention is directed to a method that comprises the steps of: (i) receiving, by a wireless earphone, via an ad hoc wireless network, digital audio from a data source when the data source is in wireless communication with the earphone via the ad hoc wireless network; (ii) converting, by the wireless earphone, the digital audio to sound; and (iii) when the data source is not in wireless communication with the earphone, transitioning automatically, by the earphone, to receive digital audio via an infrastructure wireless network.

In various implementations, the step of transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network may comprises transitioning automatically to receive digital audio from the data source via an infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network. In addition, the method may further comprise the step of receiving by the wireless earphone from the data source via the ad hoc wireless network data regarding one or more infrastructure wireless networks detected by data source when the earphone and the data source are communicating via the ad hoc wireless network.

In addition, the step of transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises may transitioning automatically to receive digital audio from a host sever via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network. Additionally, the step of transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network may comprise: (i) receiving, by the wireless earphone via the infrastructure wireless network, from a host server connected to the infrastructure wireless network, a network address for a streaming digital audio content server; and (ii) connecting, by the wireless earphone, to the streaming digital audio content server using the network address received from the host server.

It is to be understood that the figures and descriptions of the embodiments have been simplified to illustrate elements that are relevant for a clear understanding of the embodiments, while eliminating, for purposes of clarity, other elements. For example, certain operating system details for the various computer-related devices and systems are not described herein. Those of ordinary skill in the art will recognize, however, that these and other elements may be desirable in a typical processor or computer system. Because such elements are well known in the art and because they do not facilitate a better understanding of the embodiments, a discussion of such elements is not provided herein.

In general, it will be apparent to one of ordinary skill in the art that at least some of the embodiments described herein may be implemented in many different embodiments of software, firmware and/or hardware. The software and firmware code may be executed by a processor or any other similar computing device. The software code or specialized control hardware that may be used to implement embodiments is not limiting. For example, embodiments described herein may be implemented in computer software using any suitable computer software language type. Such software may be stored on any type of suitable computer-readable medium or media, such as, for example, a magnetic or optical storage medium. The operation and behavior of the embodiments may be described without specific reference to specific software code or specialized hardware components. The absence of such specific references is feasible, because it is clearly understood that artisans of ordinary skill would be able to design software and control hardware to implement the embodiments based on the present description with no more than reasonable effort and without undue experimentation.

Moreover, the processes associated with the present embodiments may be executed by programmable equipment, such as computers or computer systems and/or processors. Software that may cause programmable equipment to execute processes may be stored in any storage device, such as, for example, a computer system (nonvolatile) memory, an optical disk, magnetic tape, or magnetic disk. Furthermore, at least some of the processes may be programmed when the computer system is manufactured or stored on various types of computer-readable media.

A "computer," "computer system," "host," "host server," "server," or "processor" may be, for example and without limitation, a processor, microcomputer, minicomputer, server, mainframe, laptop, personal data assistant (PDA), wireless e-mail device, cellular phone, pager, processor, fax machine, scanner, or any other programmable device configured to transmit and/or receive data over a network. Such components may comprise: one or more processor circuits; and one more memory circuits, including ROM circuits and RAM circuits. Computer systems and computer-based devices disclosed herein may include memory for storing certain software

applications used in obtaining, processing, and communicating information. It can be appreciated that such memory may be internal or external with respect to operation of the disclosed embodiments. The memory may also include any means for storing software, including a hard disk, an optical disk, floppy disk, ROM (read only memory), RAM (random access memory), PROM (programmable ROM), EEPROM (electrically erasable PROM) and/or other computer-readable media.

In various embodiments disclosed herein, a single component may be replaced by multiple components and multiple components may be replaced by a single component to perform a given function or functions. Except where such substitution would not be operative, such substitution is within the intended scope of the embodiments. Any servers described herein, such as the host server 40, for example, may be replaced by a "server farm" or other grouping of networked servers (such as server blades) that are located and configured for cooperative functions. It can be appreciated that a server farm may serve to distribute workload between/among individual components of the farm and may expedite computing processes by harnessing the collective and cooperative power of multiple servers. Such server farms may employ load-balancing software that accomplishes tasks such as, for example, tracking demand for processing power from different machines, prioritizing and scheduling tasks based on network demand and/or providing backup contingency in the event of component failure or reduction in operability.

While various embodiments have been described herein, it should be apparent that various modifications, alterations, and adaptations to those embodiments may occur to persons skilled in the art with attainment of at least some of the advantages. The disclosed embodiments are therefore intended to include all such modifications, alterations, and adaptations without departing from the scope of the embodiments as set forth herein.

CLAIMS

What is claimed is:

1. An earphone comprising:

a body, wherein the body comprises:

at least one acoustic transducer for converting an analog electrical signal to sound;

an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:

receive digital audio wirelessly from a data source via an ad hoc wireless network when the data source is in wireless communication range with the earphone via the ad hoc wireless network; and

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive digital audio via an infrastructure wireless network.

2. The earphone of claim 1, wherein the data source comprises a digital audio player.

3. The earphone of claim 1, wherein the transceiver circuit comprises:

a wireless communication module;

a processor unit in communication with the wireless communication module;

a non-volatile memory unit in communication with the processor unit; and

a volatile memory unit in communication with the processor unit.

4. The earphone of claim 3, wherein the wireless communication module comprises a Wi-Fi communication module.

5. The earphone of claim 1, wherein the infrastructure wireless network comprises a WLAN.

6. The earphone of claim 1, wherein the transceiver circuit is for receiving digital audio from the data source via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

7. The earphone of claim 6, wherein the infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.

8 The earphone of claim 7, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to transmit data via the ad hoc wireless network to the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network.

9. The earphone of claim 8, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication via the pre-set infrastructure wireless network.

10. The earphone of claim 1, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

11. The earphone of claim 10, wherein the earphone is for receiving streaming digital audio from the host server via the infrastructure wireless network.

12. The earphone of claim 10, wherein the earphone is for receiving a first network address for a first streaming digital audio content server from the host server via the infrastructure wireless network.

13. The earphone of claim 12, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

14. The earphone of claim 13, wherein the user control comprises a button.

15. A system comprising:

a data source for wirelessly transmitting streaming digital audio; and

a wireless earphone that comprises:

at least one acoustic transducer for converting an analog electrical signal to sound;

an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware, which when executed by the transceiver circuit, causes the transceiver circuit to:

receive the streaming digital audio wirelessly from the data source via an ad hoc wireless network when the data source is in wireless communication range with the earphone via the ad hoc wireless network; and

when the data source is not in wireless communication range with the earphone via the ad hoc wireless network, transition automatically to receive streaming digital audio via an infrastructure wireless network.

16. The system of claim 15, wherein the data source comprises a digital audio player.

17. The system of claim 15, further comprising a host server that is in communication with the wireless earphone via the infrastructure wireless network.

18. The system of claim 17, wherein the firmware of the transceiver circuit of the wireless earphone, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to the host server via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

19. The system of claim 17, wherein the host server is for streaming digital audio to the earphone via the infrastructure wireless network.

20. The system of claim 17, wherein the host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the infrastructure wireless network

21. The system of claim 20, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

22. The earphone of claim 21, wherein the user control comprises a button.

23. The system of claim 18, wherein the host server hosts a web page for the wireless earphone through which a user is capable of configuring one or more settings for the wireless earphone.

24. The system of claim 15, wherein the infrastructure wireless network comprises a WLAN.

25. The system of claim 15, wherein the firmware, when executed by the infrastructure wireless network is a pre-set infrastructure wireless network that the data source transitions to when the data source is not in wireless communication range with the earphone via the ad hoc wireless network and when the pre-set infrastructure wireless network is in range of both the earphone and the data source.

26. The system of claim 25, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to transmit data via the ad hoc wireless network to

the data source regarding one or more infrastructure wireless networks detected by the transceiver circuit when the earphone and the data source are communicating via the ad hoc wireless network.

27. The system of claim 26, wherein the firmware, when executed by the transceiver circuit, causes the transceiver circuit of the earphone to connect to a host server via a second infrastructure wireless network when (1) the data source is not in wireless communication range with the earphone via the ad hoc wireless network and (2) the data source and the earphone are not in wireless communication via the pre-set infrastructure wireless network.

28. The system of claim 27, wherein the host server is for streaming digital audio to the earphone via the infrastructure wireless network.

29. The system of claim 27, wherein the host server is for transmitting a first network address for a first streaming digital audio content server to the earphone via the infrastructure wireless network

30. The system of claim 29, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the infrastructure wireless network to the host server for a second network address for a second streaming digital audio content server.

31. The earphone of claim 30, wherein the user control comprises a button.

32. A system comprising:

a host server;

a first streaming digital audio content server that is connected to the host server via a data network; and

a wireless earphone that is in communication with the host server via a wireless network, wherein the host server is programmed to transmit to the earphone a first network address for the first streaming digital audio content server.

33. The system of claim 32, wherein the wireless earphone comprises:

at least one acoustic transducer for converting an analog electrical signal to sound;

an antenna; and

a transceiver circuit in communication with the at least one acoustic transducer and the antenna, wherein the transceiver circuit is for receiving and transmitting wireless signals via the antenna, and wherein the transceiver circuit is for outputting the analog electrical signal to the at least one acoustic transducer, and wherein the wireless transceiver circuit comprises firmware that is executed by the transceiver circuit.

34. The system of claim 33, wherein the host server hosts a web page for the wireless earphone through which a user is capable of configuring one or more settings for the wireless earphone.

35. The system of claim 34, wherein the one or more settings comprise the first streaming digital audio content server and a second streaming digital audio content server.

36. The system of claim 35, wherein the earphone comprises a user control that, when activated, causes the earphone to submit an electronic request via the wireless network to the host server for a second network address for the second streaming digital audio content server.

37. A headset comprising:

a first earphone that comprises one or more acoustic transducers for converting a first analog electrical signal to sound; and

a second earphone, connected to the first earphone, wherein the second earphone comprises one or more acoustic transducers for converting a second analog electrical signal to sound, and wherein the first earphone comprises:

a first antenna; and

a first transceiver circuit in communication with the one or more acoustic transducers of the first earphone and in communication with the first antenna, wherein the first transceiver circuit is for receiving and transmitting wireless signals via the first antenna, and wherein the first transceiver circuit is for outputting the first analog electrical signal to the one or more acoustic transducers of the first earphone, and wherein the first transceiver circuit comprises firmware, which when executed by the first transceiver circuit, causes the first transceiver circuit to:

receive digital audio wirelessly from a data source via an ad hoc wireless network when the data source is in wireless communication range with the first earphone via the ad hoc wireless network; and

when the data source is not in wireless communication range with the first earphone via the ad hoc wireless network, transition automatically to receive digital audio via an infrastructure wireless network.

38. The headset of claim 37, further comprising a head band, wherein the first and second earphones are connected to the headband.

39. The headset of claim 37, further comprising a microphone having an output connected to the first transceiver circuit.

40. The headset of claim 37, wherein the first transceiver circuit is for outputting the second analog electrical signal to the one or more acoustic transducers of the second earphone.

41. The headset of claim 37, wherein the second earphone comprises:

a second antenna; and

a second transceiver circuit in communication with the one or more acoustic transducers of the second earphone and in communication with the second antenna, wherein the second transceiver circuit is for receiving and transmitting wireless signals via the second antenna, and wherein the second transceiver circuit is for outputting the second analog electrical signal to the one or more acoustic transducers of the second earphone, and wherein the second transceiver circuit comprises firmware, which when executed by the second transceiver circuit, causes the second transceiver circuit to:

receive digital audio wirelessly from the data source via the ad hoc wireless network when the data source is in wireless communication range with the second earphone via the ad hoc wireless network; and

when the data source is not in wireless communication range with the second earphone via the ad hoc wireless network, transition automatically to receive digital audio via the infrastructure wireless network.

42. The headset of claim 37, wherein the first earphone comprises a first data port and the second earphone comprises a second data port, and wherein the headset further comprises an adapter connected to the first data port of the first earphone and to the second data port of the second earphone, and wherein the adapter comprises an output plug connector for connecting to a remote device.

43. A method comprising:

receiving, by a wireless earphone, via an ad hoc wireless network, digital audio from a data source when the data source is in wireless communication with the earphone via the ad hoc wireless network;

converting, by the wireless earphone, the digital audio to sound; and

when the data source is not in wireless communication with the earphone, transitioning automatically, by the earphone, to receive digital audio via an infrastructure wireless network.

44. The method of claim 43, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises transitioning automatically to receive digital audio from the data source via an infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network.

45. The method of claim 43, further comprising, receiving by the wireless earphone from the data source via the ad hoc wireless network data regarding one or more infrastructure wireless

networks detected by data source when the earphone and the data source are communicating via the ad hoc wireless network.

46. The method of claim 43, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises transitioning automatically to receive digital audio from a host sever via the infrastructure wireless network when the data source is not in wireless communication range with the earphone via the ad hoc wireless network

47. The method of claim 43, wherein transitioning automatically by the earphone to receive digital audio via an infrastructure wireless network comprises:

receiving, by the wireless earphone via the infrastructure wireless network, from a host server connected to the infrastructure wireless network, a network address for a streaming digital audio content server; and

connecting, by the wireless earphone, to the streaming digital audio content server using the network address received from the host server.

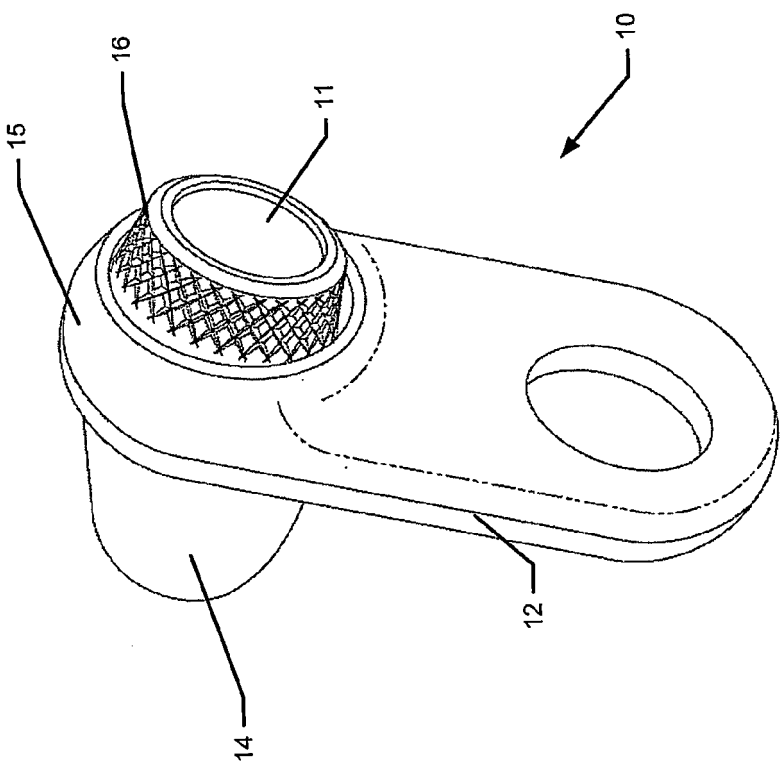

Fig. 1B

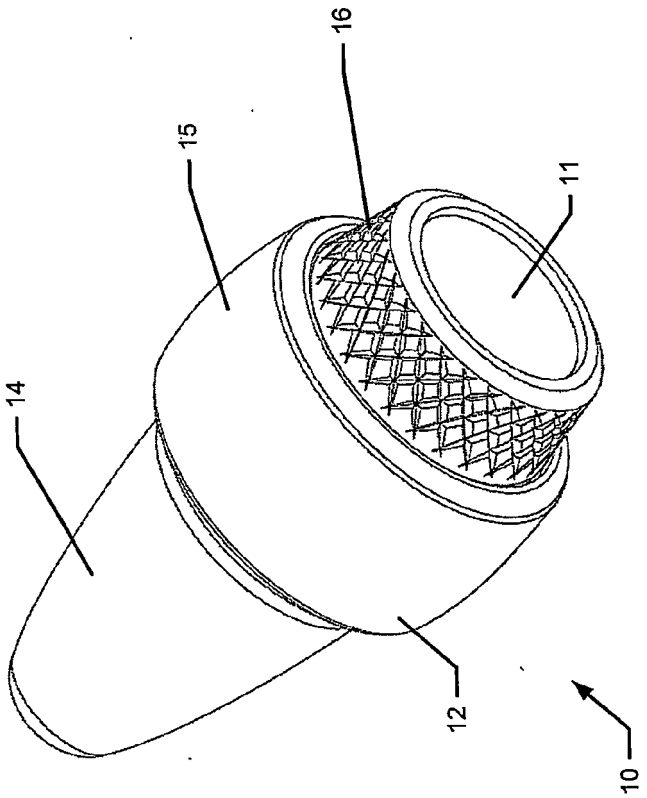

Fig. 1A

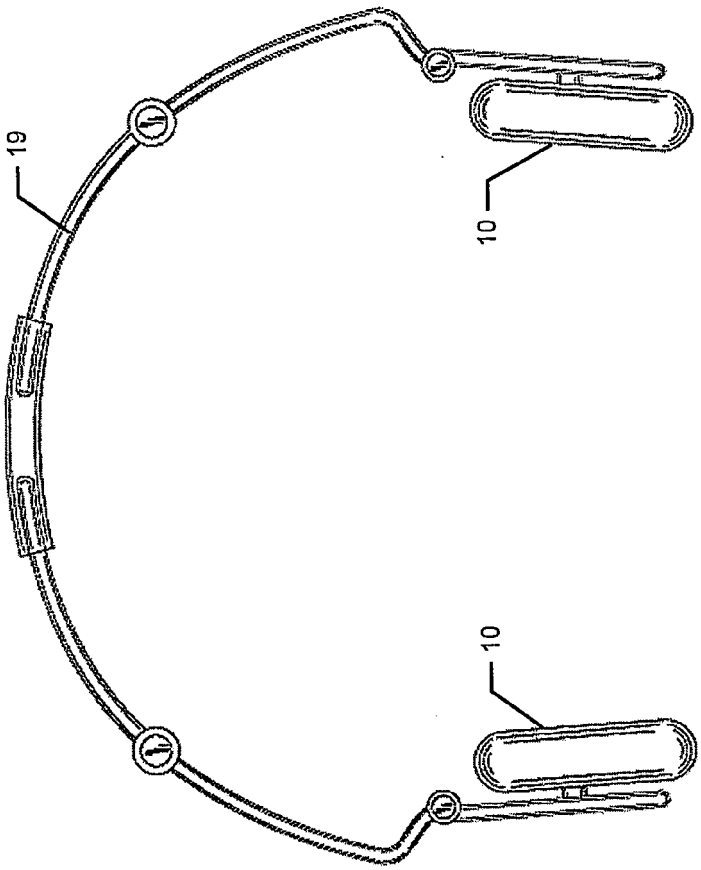

Fig. 1C

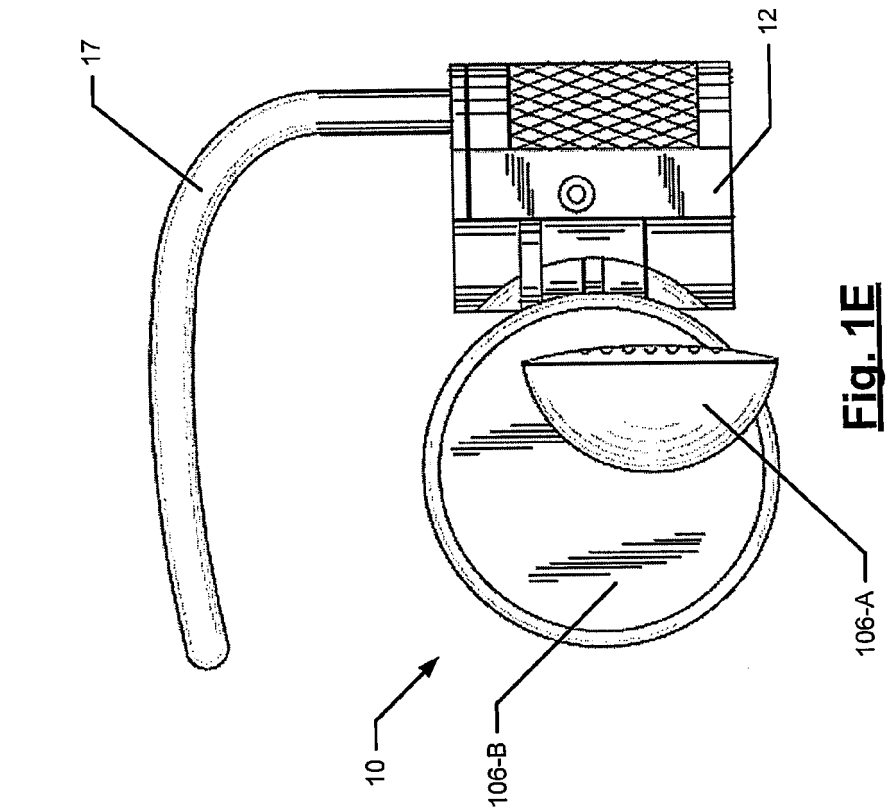

Fig. 1E

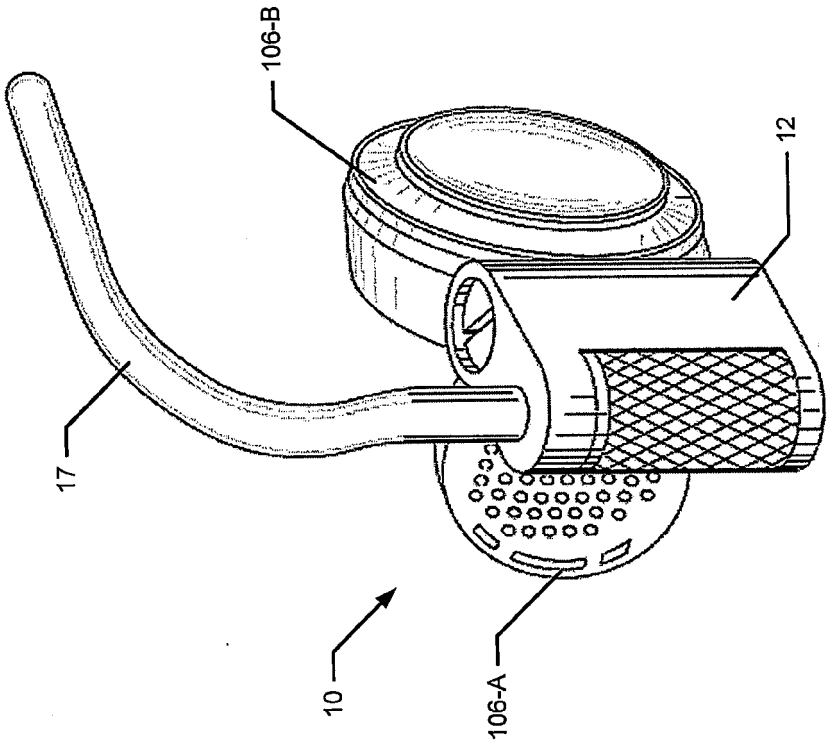

Fig. 1D

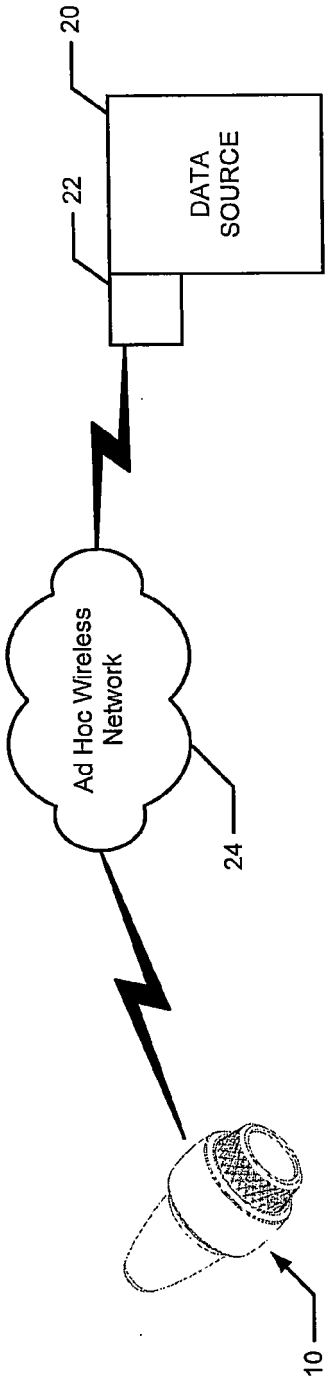

Fig. 2A

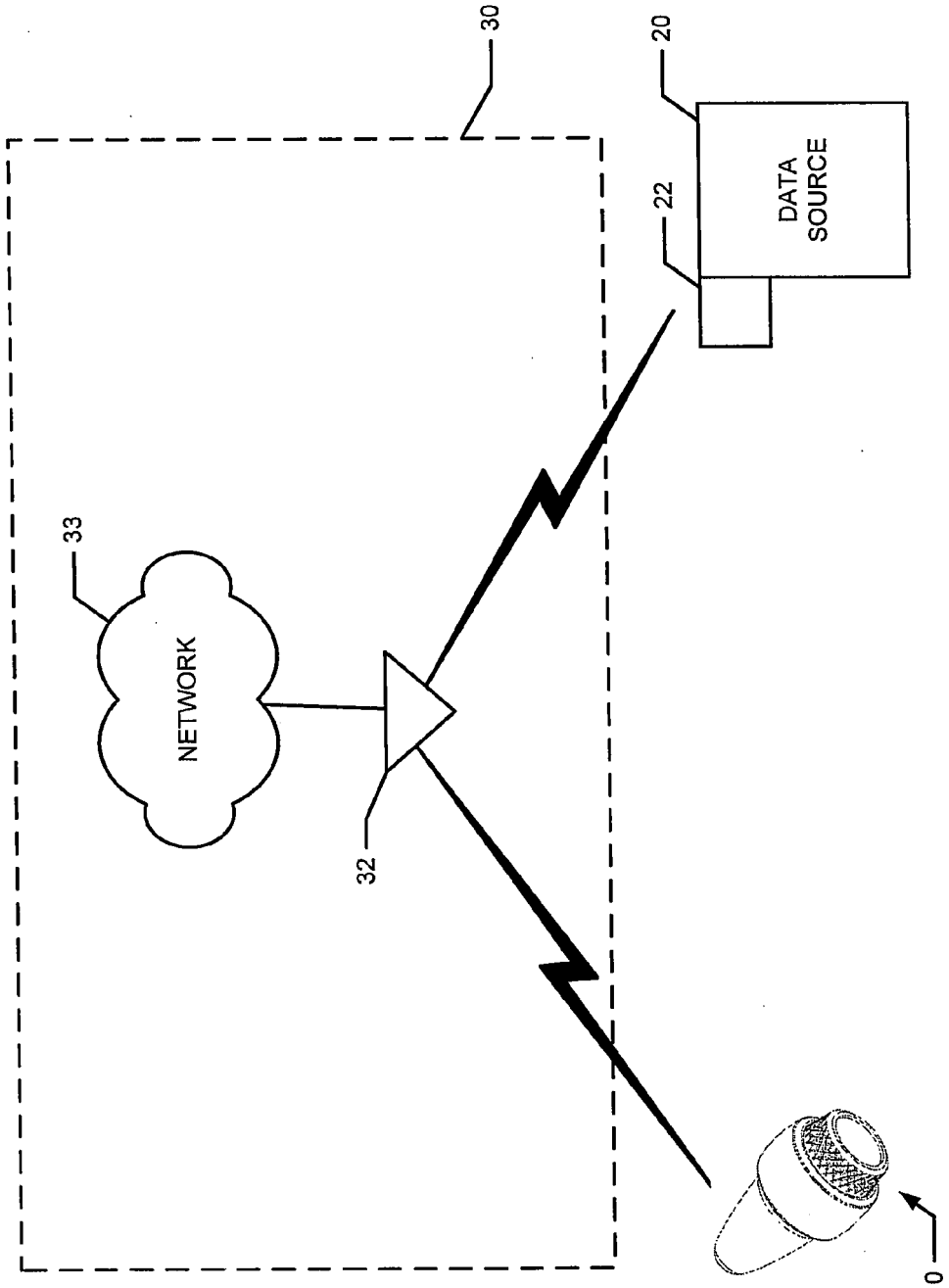

Fig. 2B

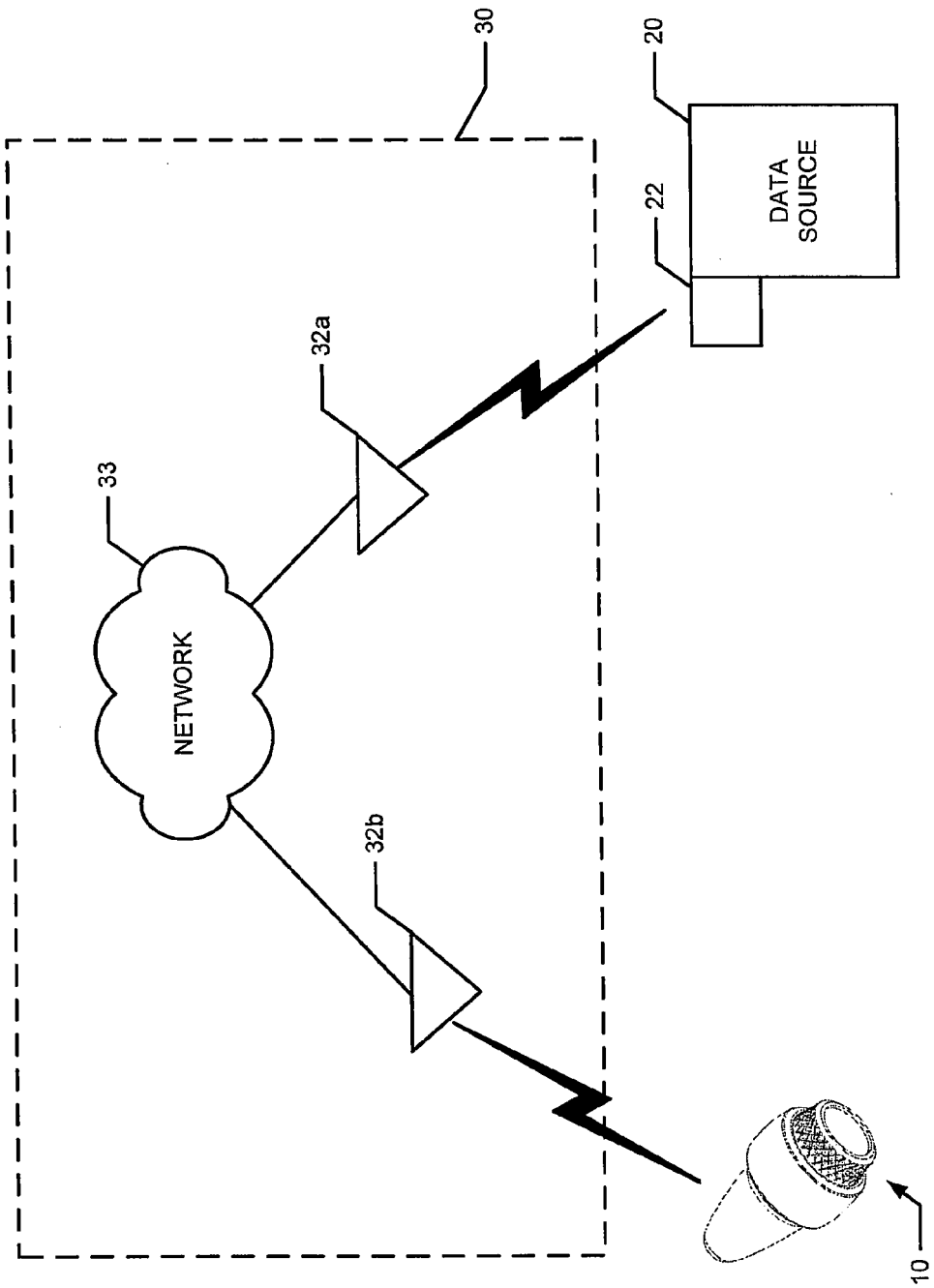

Fig. 2C

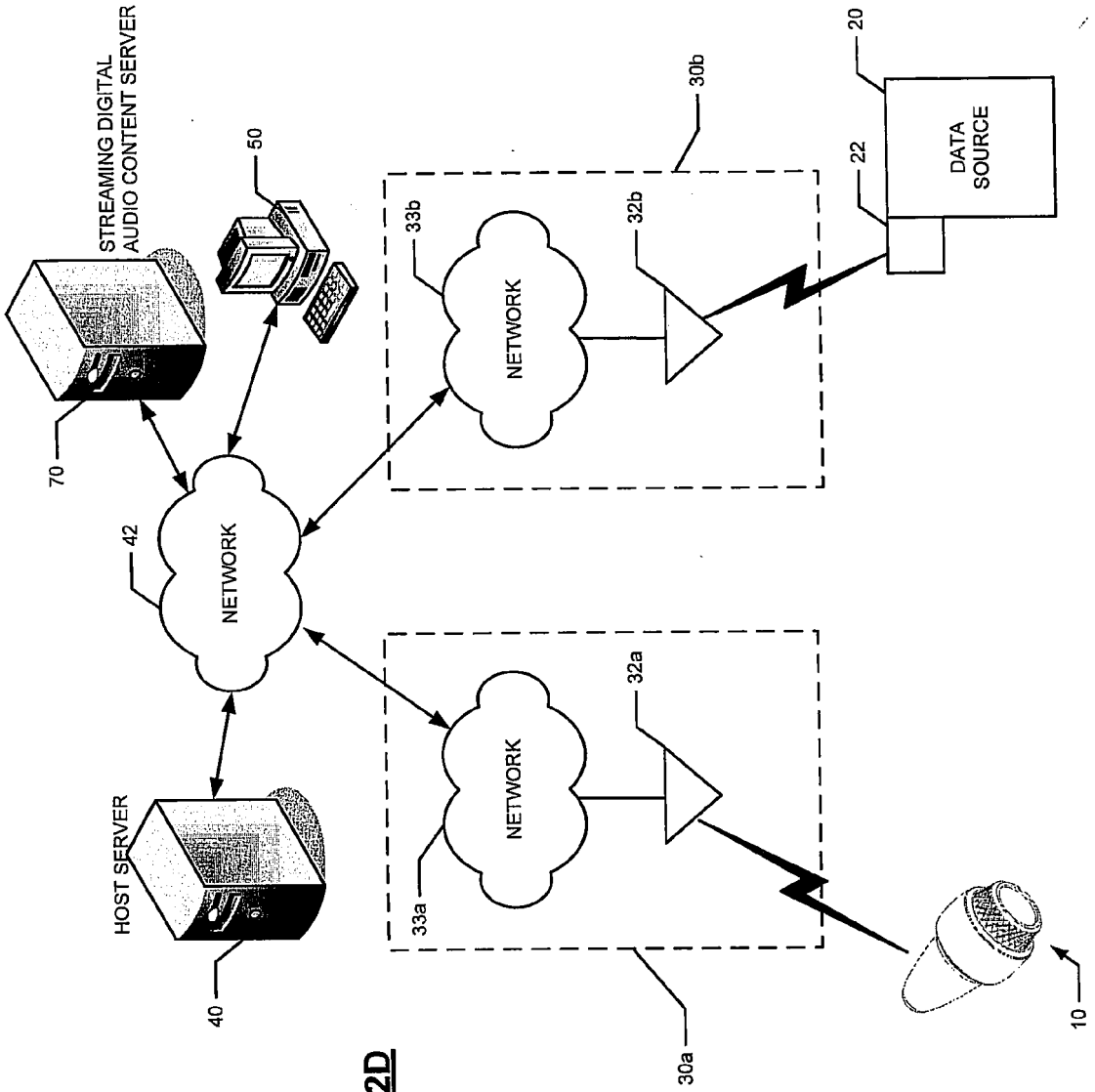
STREAMING DIGITAL AUDIO CONTENT SERVER
50
70
NETWORK
42
HOST SERVER
40
33b
NETWORK
32b
30b
20
DATA SOURCE
22
33a
NETWORK
32a
30a
10

Fig. 2D

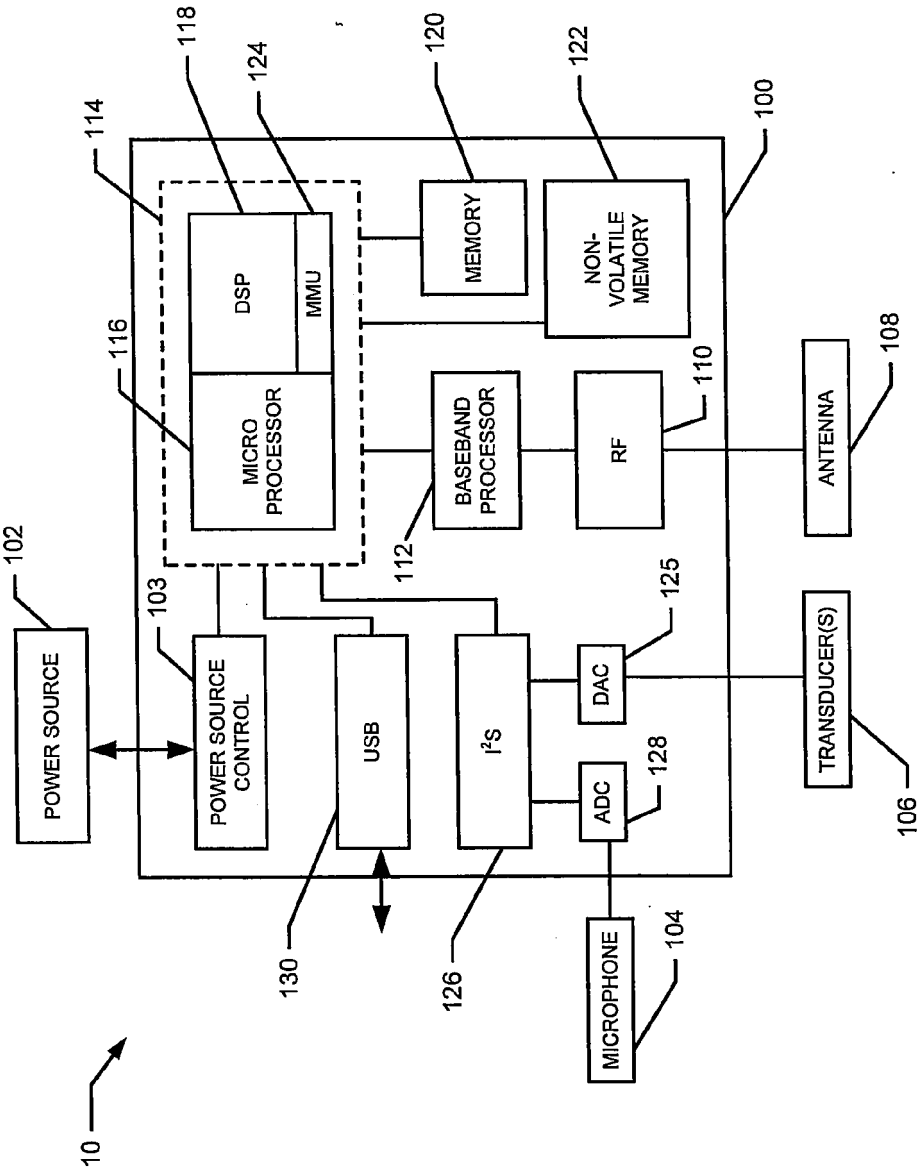
10
POWER SOURCE
102
POWER SOURCE CONTROL
103
DSP
MMU
MICRO PROCESSOR
116
114
118
124
MEMORY
120
NON-VOLATILE MEMORY
122
100
BASEBAND PROCESSOR
112
RF
110
ANTENNA
108
USB
130
I²S
126
DAC
125
ADC
128
MICROPHONE
104
TRANSDUCER(S)
106

Fig. 3

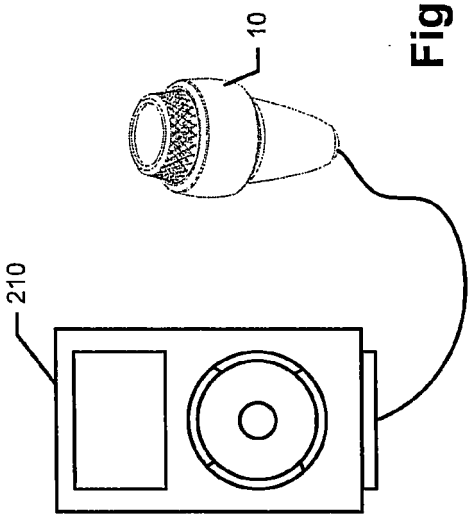

Fig. 4B

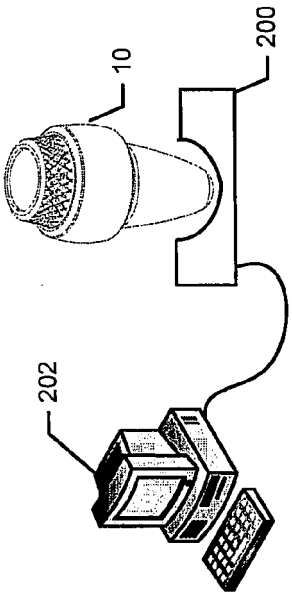

Fig. 4A

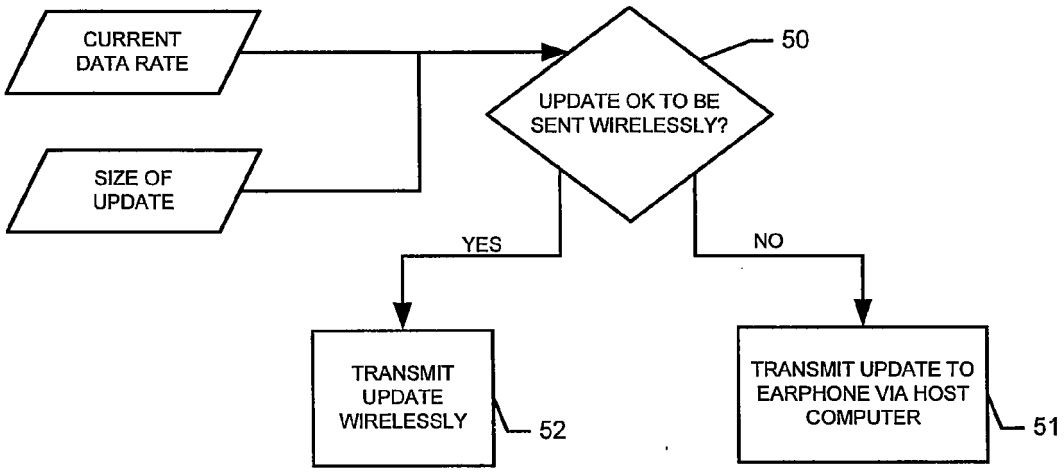
CURRENT DATA RATE
SIZE OF UPDATE
UPDATE OK TO BE SENT WIRELESSLY?
50
YES
NO
TRANSMIT UPDATE WIRELESSLY
52
TRANSMIT UPDATE TO EARPHONE VIA HOST COMPUTER
51

Fig. 5

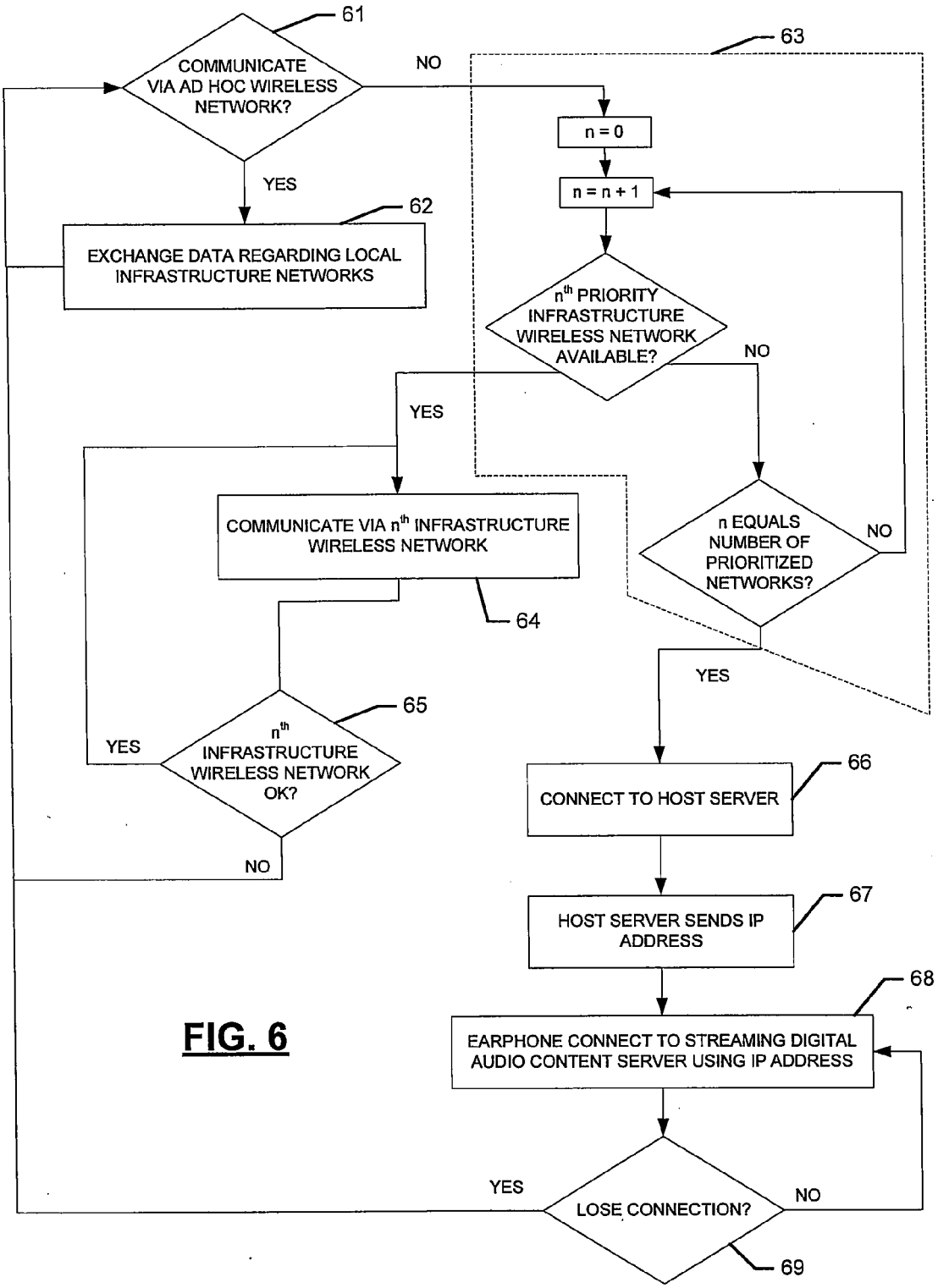
61
COMMUNICATE VIA AD HOC WIRELESS NETWORK?
NO
YES
62
EXCHANGE DATA REGARDING LOCAL INFRASTRUCTURE NETWORKS
63
n = 0
n = n + 1
nth PRIORITY INFRASTRUCTURE WIRELESS NETWORK AVAILABLE?
NO
YES
COMMUNICATE VIA nth INFRASTRUCTURE WIRELESS NETWORK
64
n EQUALS NUMBER OF PRIORITIZED NETWORKS?
NO
YES
65
nth INFRASTRUCTURE WIRELESS NETWORK OK?
YES
NO
66
CONNECT TO HOST SERVER
67
HOST SERVER SENDS IP ADDRESS
68
EARPHONE CONNECT TO STREAMING DIGITAL AUDIO CONTENT SERVER USING IP ADDRESS
YES
LOSE CONNECTION?
NO
69

FIG. 6

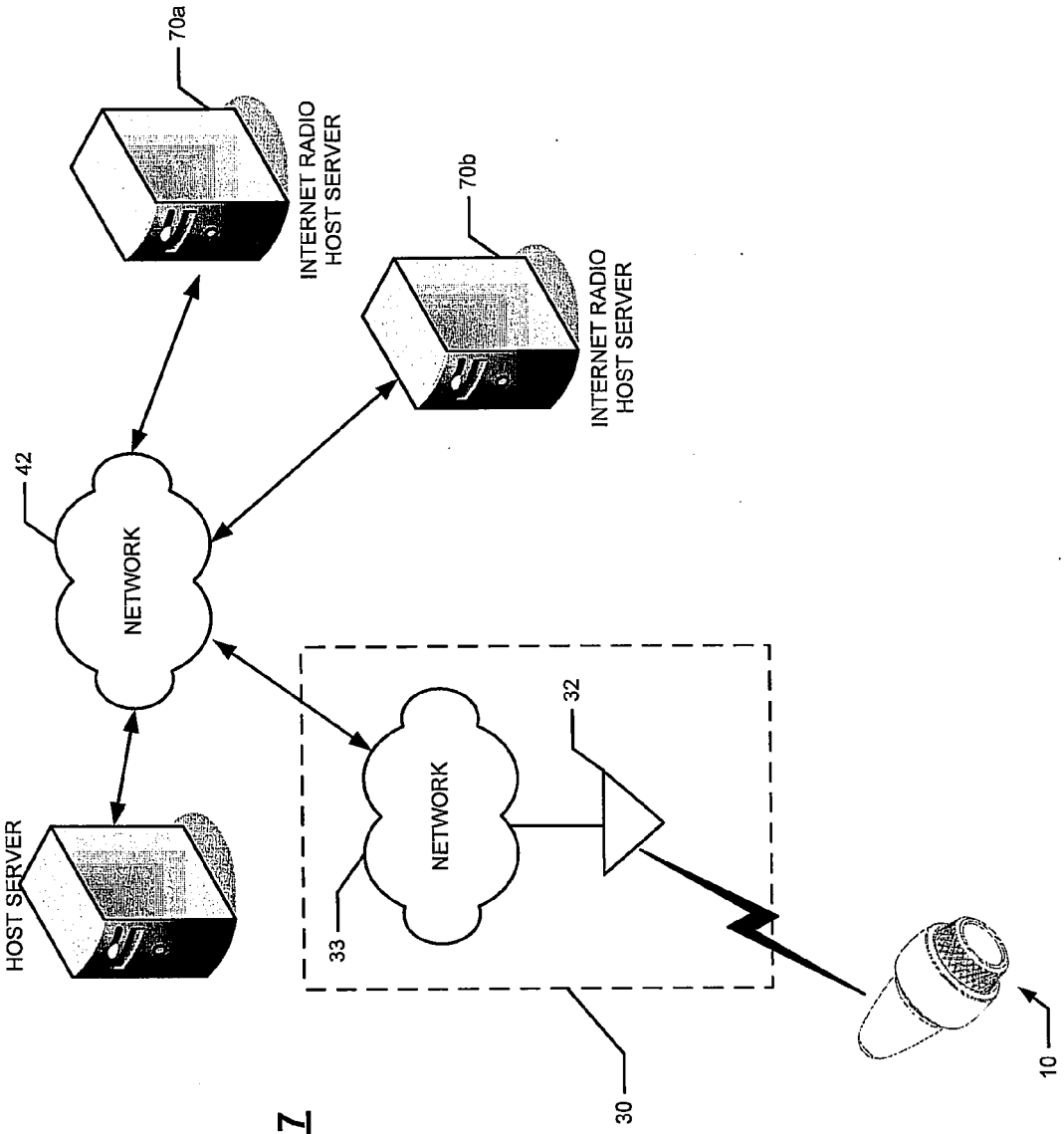
70a
INTERNET RADIO HOST SERVER
70b
INTERNET RADIO HOST SERVER
42
NETWORK
HOST SERVER
NETWORK
32
33
30
10

Fig. 7

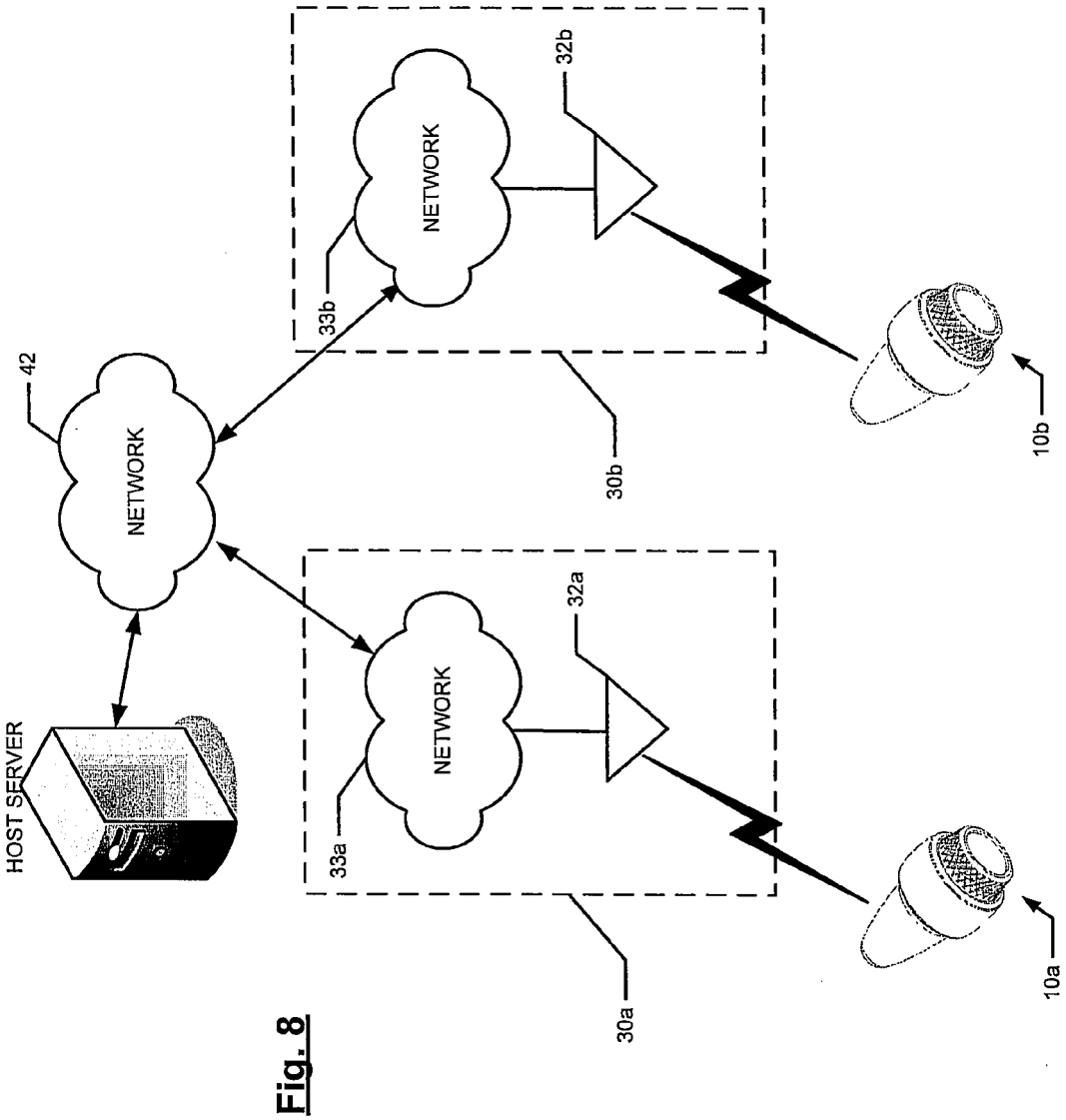
HOST SERVER
NETWORK
42
NETWORK
33a
32a
30a
10a
NETWORK
33b
32b
30b
10b

Fig. 8

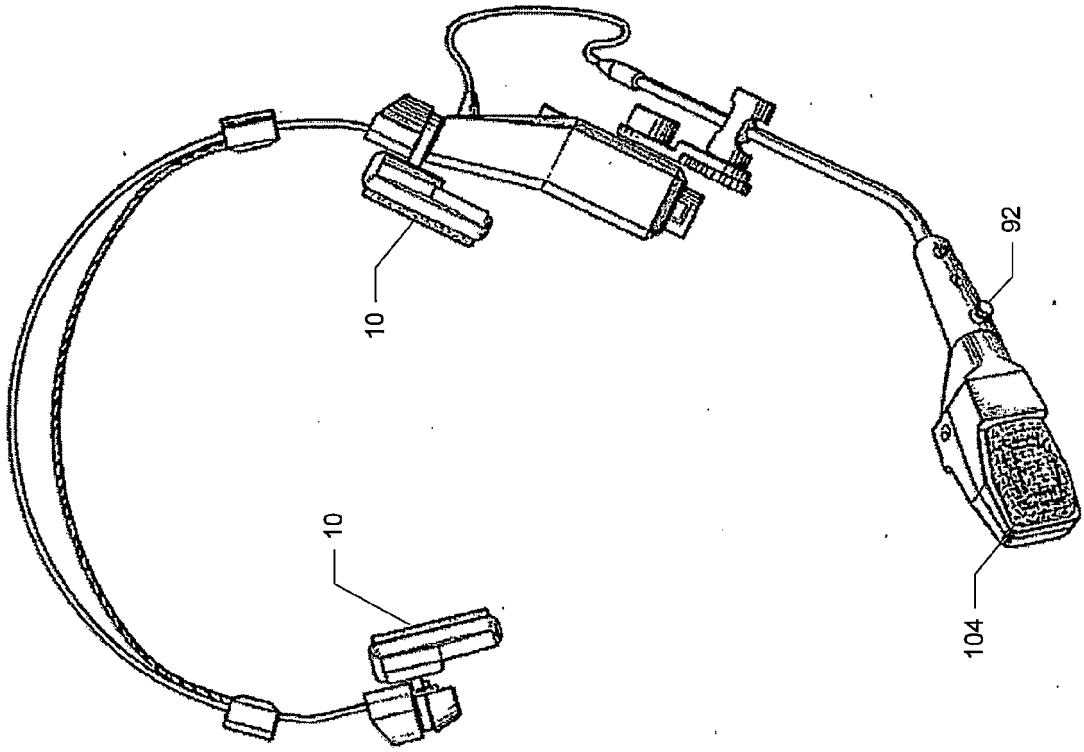

Fig. 9

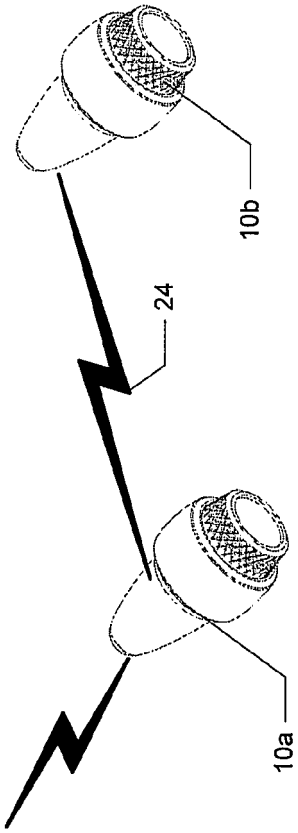

Fig. 10

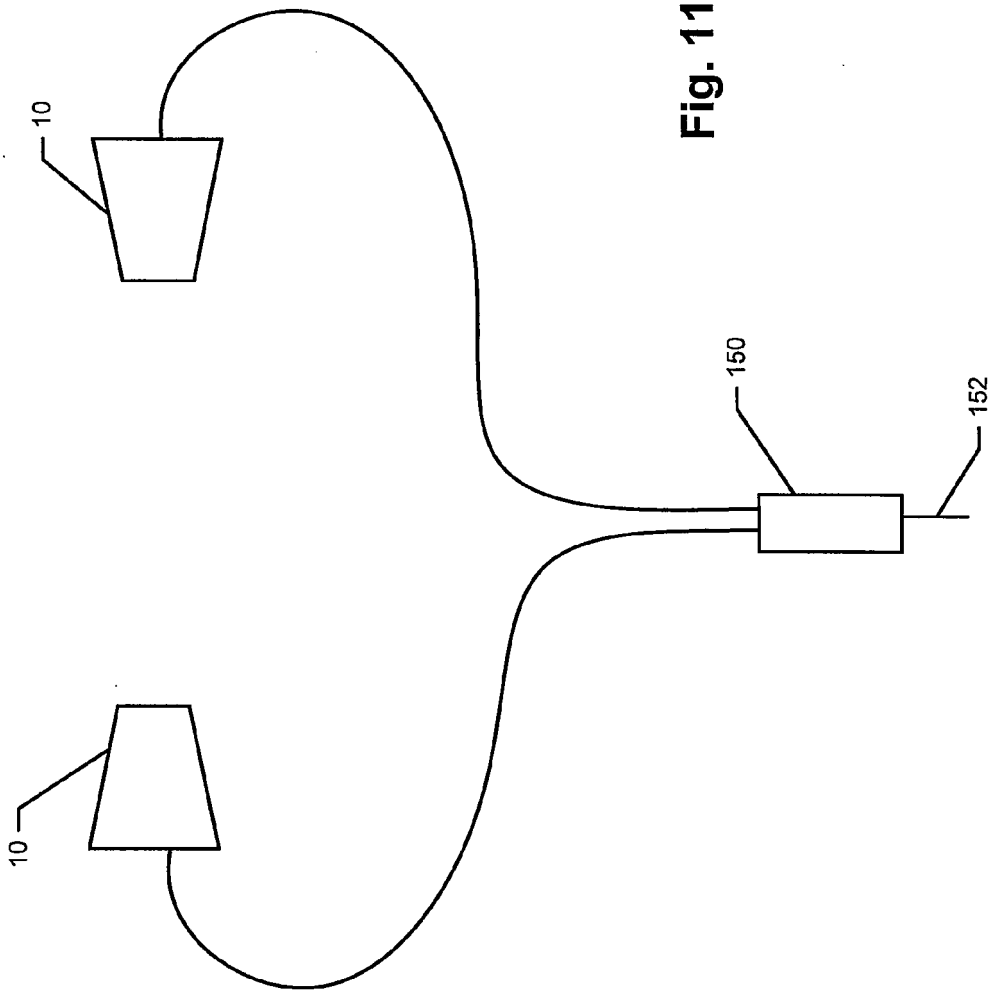

Fig. 11