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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
62/209,221	08/24/2015		130	MINIX 15-4-1		

23531
SUITER SWANTZ PC LLO
14301 FNB PARKWAY
SUITE 220
OMAHA, NE 68154

CONFIRMATION NO. 8997
FILING RECEIPT



Date Mailed: 09/11/2015

Receipt is acknowledged of this provisional patent application. It will not be examined for patentability and will become abandoned not later than twelve months after its filing date. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Paul Beard, Bigfork, MT;

Applicant(s)

Microavionix Corporation, Omaha, NE;

Power of Attorney:

Richard Kruse--67539

If Required, Foreign Filing License Granted: 09/10/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 62/209,221**

Projected Publication Date: None, application is not eligible for pre-grant publication

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

Automatic Dependent Surveillance Broadcast Transmission within Whitespace

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international

application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

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Provisional Application for Patent Cover Sheet

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c)

Inventor(s)

Inventor 1

Remove

Given Name

Middle Name

Family Name

City

State

Country i

Paul

Beard

Bigfork

MT

US

All Inventors Must Be Listed – Additional Inventor Information blocks may be generated within this form by selecting the **Add** button.

Add

Title of Invention

Automatic Dependent Surveillance Broadcast Transmission within Whitespace

Attorney Docket Number (if applicable)

MINIX 15-4-1

Correspondence Address

Direct all correspondence to (select one):

☒ The address corresponding to Customer Number

☐ Firm or Individual Name

Customer Number

23531

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 invention was made by an agency of the United States Government. The U.S. Government agency name is:

☐ Yes, the invention was under a contract with an agency of the United States Government. The name of the U.S. Government agency and Government contract number are:

Entity Status**Applicant asserts small entity status under 37 CFR 1.27 or applicant certifies micro entity status under 37 CFR 1.29**

- ☒ Applicant asserts small entity status under 37 CFR 1.27
- ☐ Applicant certifies micro entity status under 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
- ☐ No

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 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

Please see 37 CFR 1.4(d) for the form of the signature.

Signature	/richard a kruse/			Date (YYYY-MM-DD)	2015-08-24
First Name	Richard A.	Last Name	Kruse	Registration Number (If appropriate)	67539

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. **This form can only be used when in conjunction with EFS-Web. If this form is mailed to the USPTO, it may cause delays in handling the provisional application.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that : (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	MINIX 15-4-1
		Application Number	
Title of Invention	Automatic Dependent Surveillance Broadcast Transmission within Whitespace		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
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Inventor Information:

Inventor 1					Remove	
Legal Name						
Prefix	Given Name	Middle Name	Family Name	Suffix		
	Paul		Beard			
Residence Information (Select One) ☒ US Residency ☐ Non US Residency ☐ Active US Military Service						
City	Bigfork	State/Province	MT	Country of Residence i	US	
Mailing Address of Inventor:						
Address 1		300 Pine Needle Lane				
Address 2						
City	Bigfork	State/Province	MT			
Postal Code	59911	Country i	US			
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.						
Add						

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence Information of this application.			
Customer Number	23531		
Email Address	file@suiter.com	Add Email	Remove Email

Application Information:

Title of the Invention	Automatic Dependent Surveillance Broadcast Transmission within Whitespace		
Attorney Docket Number	MINIX 15-4-1	Small Entity Status Claimed	☒
Application Type	Provisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	4	Suggested Figure for Publication (if any)	

Filing By Reference :

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	MINIX 15-4-1
		Application Number	
Title of Invention	Automatic Dependent Surveillance Broadcast Transmission within Whitespace		

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☒ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	23531		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the application number blank.

Prior Application Status		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.			Add

Foreign Priority Information:

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	MINIX 15-4-1
		Application Number	
Title of Invention	Automatic Dependent Surveillance Broadcast Transmission within Whitespace		

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove			
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)
Additional Foreign Priority Data may be generated within this form by selecting the Add button.			Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013. NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	MINIX 15-4-1
		Application Number	
Title of Invention	Automatic Dependent Surveillance Broadcast Transmission within Whitespace		

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.

Applicant Information:

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Applicant 1			Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
Clear			
☒ Assignee	☐ Legal Representative under 35 U.S.C. 117	☐ Joint Inventor	
☐ Person to whom the inventor is obligated to assign.		☐ Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor :			
If the Applicant is an Organization check here. ☒			
Organization Name	Microavionix Corporation		
Mailing Address Information:			
Address 1	11248 John Galt Boulevard		
Address 2			
City	Omaha	State/Province	NE
Country ⁱ	US	Postal Code	68137
Phone Number		Fax Number	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	MINIX 15-4-1
		Application Number	
Title of Invention	Automatic Dependent Surveillance Broadcast Transmission within Whitespace		
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button.			Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1				
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
				Remove
If the Assignee or Non-Applicant Assignee is an Organization check here.				☐
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country i		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				Add

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications				
Signature	/richard a kruse/		Date (YYYY-MM-DD)	2015-08-24
First Name	Richard A.	Last Name	Kruse	Registration Number
				67539
Additional Signature may be generated within this form by selecting the Add button.				Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	MINIX 15-4-1
		Application Number	
Title of Invention	Automatic Dependent Surveillance Broadcast Transmission within Whitespace		

This collection of information is required by 37 CFR 1.76. 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 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet 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.**

Privacy Act Statement

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

**AUTOMATIC DEPENDENT SURVEILLANCE BROADCAST
TRANSMISSION WITHIN WHITESPACE**

TECHNICAL FIELD

[0001] The invention is generally related to autonomous vehicles and more specifically to a system and apparatus for providing redundant communications paths relating to position and safety of operation of Unmanned Aircraft Systems (UAS) within shared airspace.

BACKGROUND

[0002] Position reporting of UAS may be desirable to prevent conflict between a first UAS and another proximal aircraft. Some position reporting capabilities may include an approved frequency spectrum and bandwidth unsuitable for light UAS.

[0003] ADS-B Out provides ATC and nearby aircraft with real-time position information. ADS-B In refers to an appropriately equipped aircraft's ability to receive and display another aircraft's ADS-B Out information as well as the ADS-B In services provided by ground systems, including Automatic Dependent Surveillance-Rebroadcast (ADS-R), Traffic Information Service-Broadcast (TIS-B), and, if so equipped, Flight Information Service-Broadcast (FIS-B).

[0004] These broadcast and transmissions may be limited to a specific frequency band and federal regulation may prohibit additional transmissions within these federally approved frequency bands.

[0005] Therefore, a need remains for additional position reporting capabilities available to light UAS desiring flight within specific airspace.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 is a highly diagrammatic overhead view of a system for UAS communication exemplary of one embodiment of the present invention;

[0007] FIG. 2 is a highly diagrammatic side view of a system for UAS communication exemplary of one embodiment of the present invention;

[0008] FIG. 3 is a highly diagrammatic overhead view of available white space channels by US county applicable to an embodiment of the present invention; and

[0009] FIG. 4 is an overhead view of potential towers, channels and ranges available to one embodiment of the present invention.

DETAILED DESCRIPTION

[0010] Embodiments of the present invention are directed to a system and method for connecting (networking) one or more UAS with currently ADS-B networked aviation traffic.

[0011] Referring to FIG. 1, an overhead view of potential system for UAS communication is shown. In one embodiment, a system 100 including a network of towers 140-146 may enable long range communication between a first UAS 110 and a third UAS 114 via the network of towers. The first UAS 110 may be within range of one transmitter receiver (T/R) mounted on a tower 140 while the third UAS 146 may be within range of the T/R mounted on tower 146.

[0012] Each tower within the network of towers may maintain connectivity with each of the other towers via a wireless link 150 and a wired link 152. In this manner, the first UAS 110 may maintain awareness with the third UAS 114 via signals transmitted via each of the wireless link 150 and the wired link 152.

[0013] UAS ADS-B Out signals 130 may be transmitted from the first UAS 110 via the network of towers to each of the other UAS in connectivity with the network. In addition, each of the UAS 110 112 114 may be configured for passive reception of ADS-B out signals 122 (e.g., universal access transceiver (UAT)) from ADS-B equipped aircraft 120. These traditional ADS-B out signals 122 may include standard information associated with the ADS-B systems. For example, each of the UAS ADS-B out signals 130 and the traditional ADS-B out signals 122 may include similar information concerning the transmitting platform (e.g., airspeed, altitude and position).

[0014] Each tower based T/R may be configured for transmission and reception on a specific range of frequencies. For example, one exemplary tower 140 may be configured for transmission and reception of a 512 to 698 MHz range of frequencies previously used as broadcast television frequencies.

[0015] The system 100 may enable UAS 110 to maintain awareness of each of the other UAS 112 and UAS 114 as well as a local ADS-B configured aircraft 120 via the traditional (UAT) ADS-B signals 122.

[0016] A first UAS 110 may be configured for transmit on a frequency matching that of the tower 140 (e.g., 512-698 MHz) to transmit and receive the UAS ADS-B signals 130 via the selected frequency. Additionally, the second UAS 112 and a third UAS 114 may be similarly configured for communications with a tower 140 closest to their respective position. In this manner, each of the first 110, second 112, and third 114 UAS may maintain awareness with the other UAS via the UAS ADS-B signals 130 transmitted from each to the network of towers.

[0017] In another embodiment, the towers 140 may be specifically configured for transmission and reception in a lower frequency range of 54 to 108 MHz. In this manner, the longer range and barrier penetration capabilities of the lower frequencies may enable the present invention signals to maintain connectivity with the UAS through extended low altitude operations.

[0018] Referring to FIG. 2, a system 200 may enable connectivity between the UAS ADS-B enabled UAS 110 and the traditional ADS-B configured aircraft 120. In one embodiment, the system may enable the first UAS 110 send and receive the UAS ADS-B signals 130 via the network of towers as above. However, an additional interface 246 may enable the traditional ADS-B configured aircraft 120 to now maintain awareness on the UAS traffic 110 and 112.

[0019] In one embodiment, the system 200 may enable the traditionally equipped aircraft 120 to receive the ADS-B information concerning the UAS 110 via a Traffic Information Service Broadcast TIS-B 242 link between an ADS-B tower 240 and the traditional aircraft 120. This interface 246 may extend both sets of information to each network. For example, UAS ADS-B signals 130 may be extended to the Traditional ADS-B network via the TIS-B and the traditional ADS-B signals may be extended from the ADS-B network to the UAS 110 equipped to communicate with the network of towers 152. TIS-B is broadcast to aircraft using both the 1090 MHz extended squitter (1090 ES) and the UAT band of automatic dependent surveillance-broadcast (ADS-B).

[0020] In one embodiment, the network of towers may operate within the frequencies previously used for broadcast television. For example,

[0021] Channel 47 (e.g., 668 -674 MHz)

[0022] Channel 48 (e.g., 674-680 MHz)

[0023] Channel 49 (e.g., 680-686 MHz)

[0024] Channel 50 (e.g., 686-692 MHz) and

[0025] Channel 451 (e.g., 692-698 MHz).

[0026] These may be some examples of unused spectrum or “white” space formerly used by wide spectrum use applications (e.g., broadcast TV).

[0027] FIG. 3 illustrates channels which may be available to the system 100 for transmission reception to each of the UAS 110.

[0028] FIG. 4 illustrates an exemplary geographic representation of available towers and signal strength available to the systems 100 for connectivity with the UAS 110.

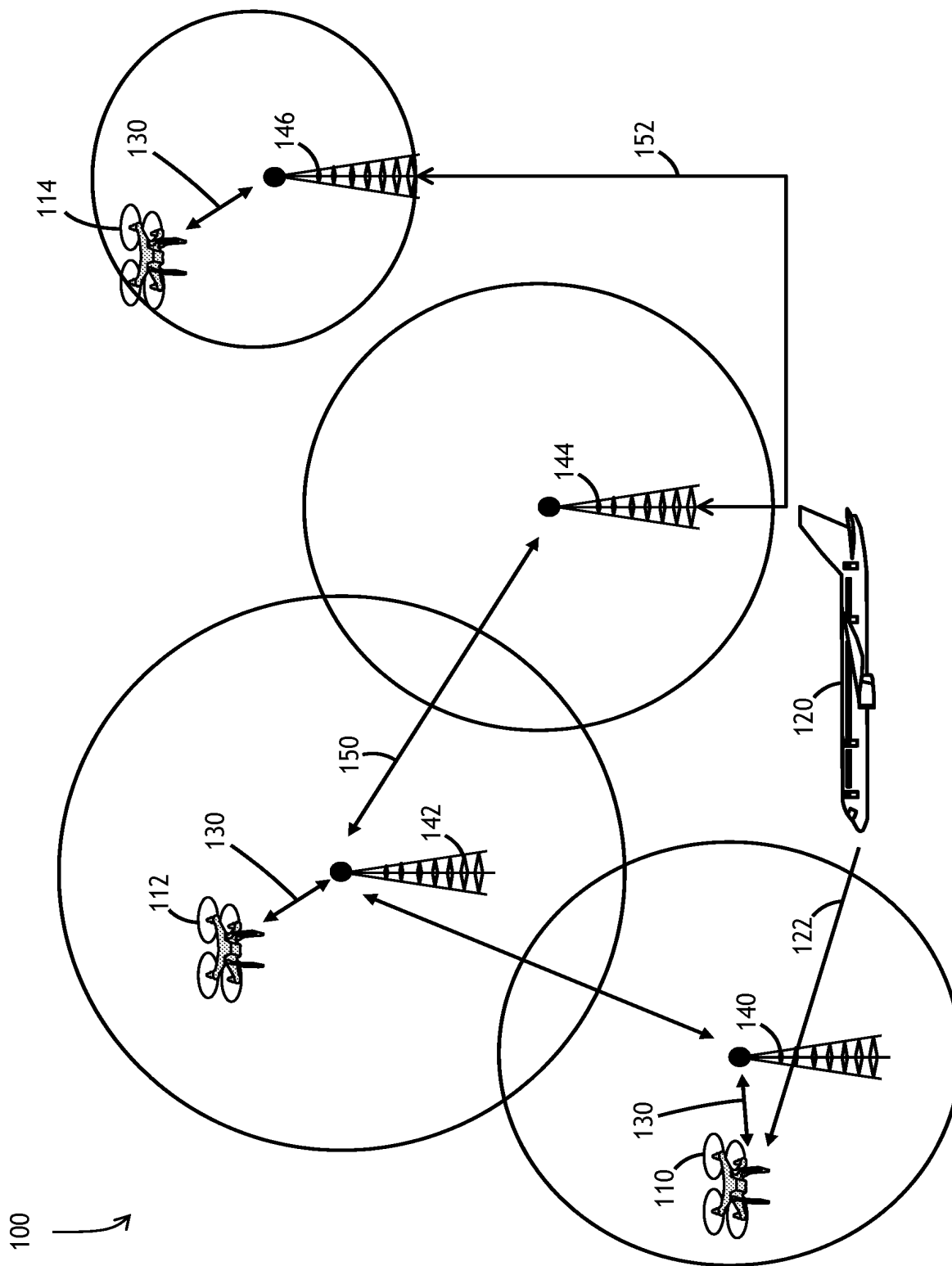


FIG. 1

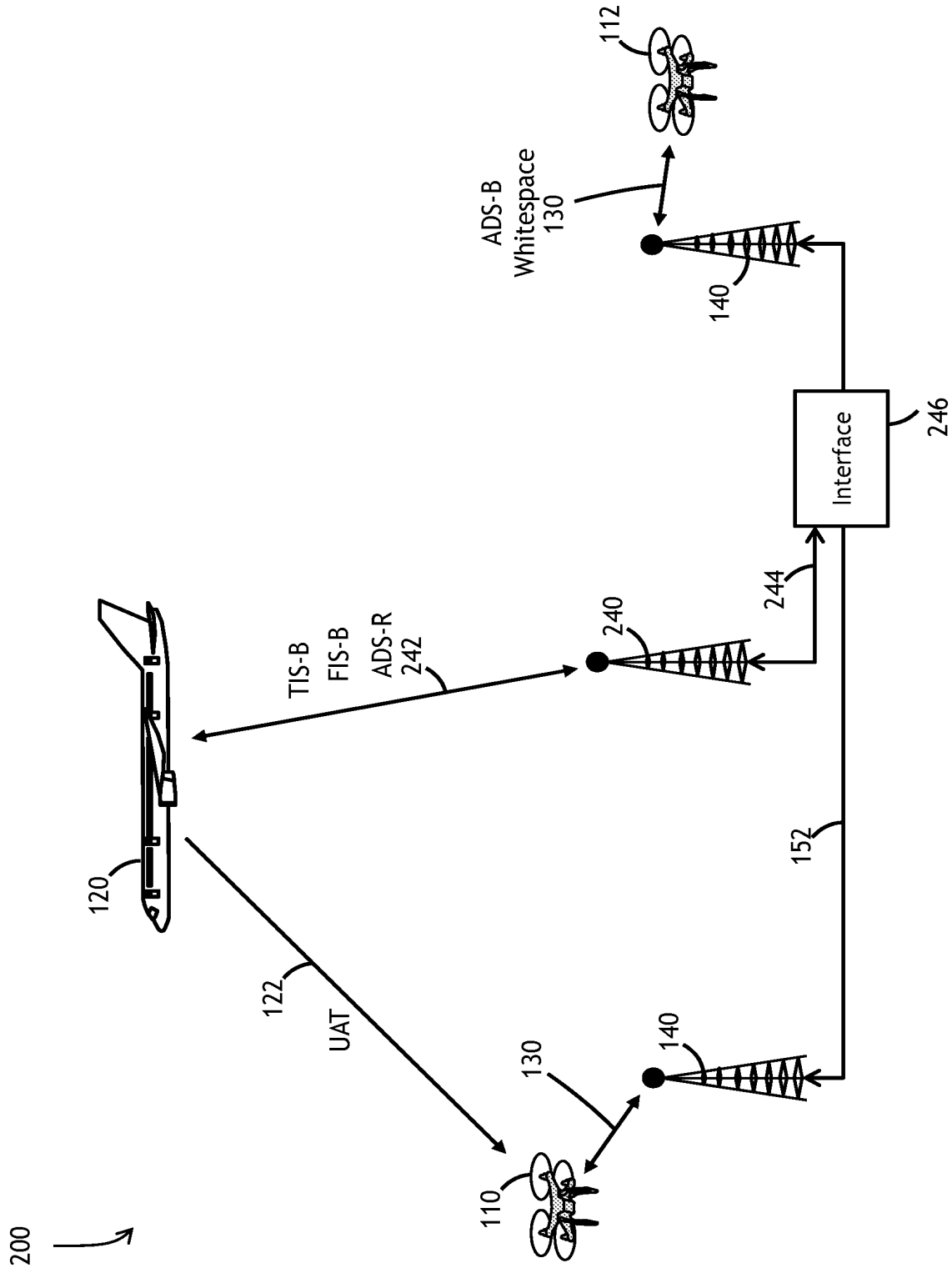


FIG. 2

300 ↗

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3 / 4

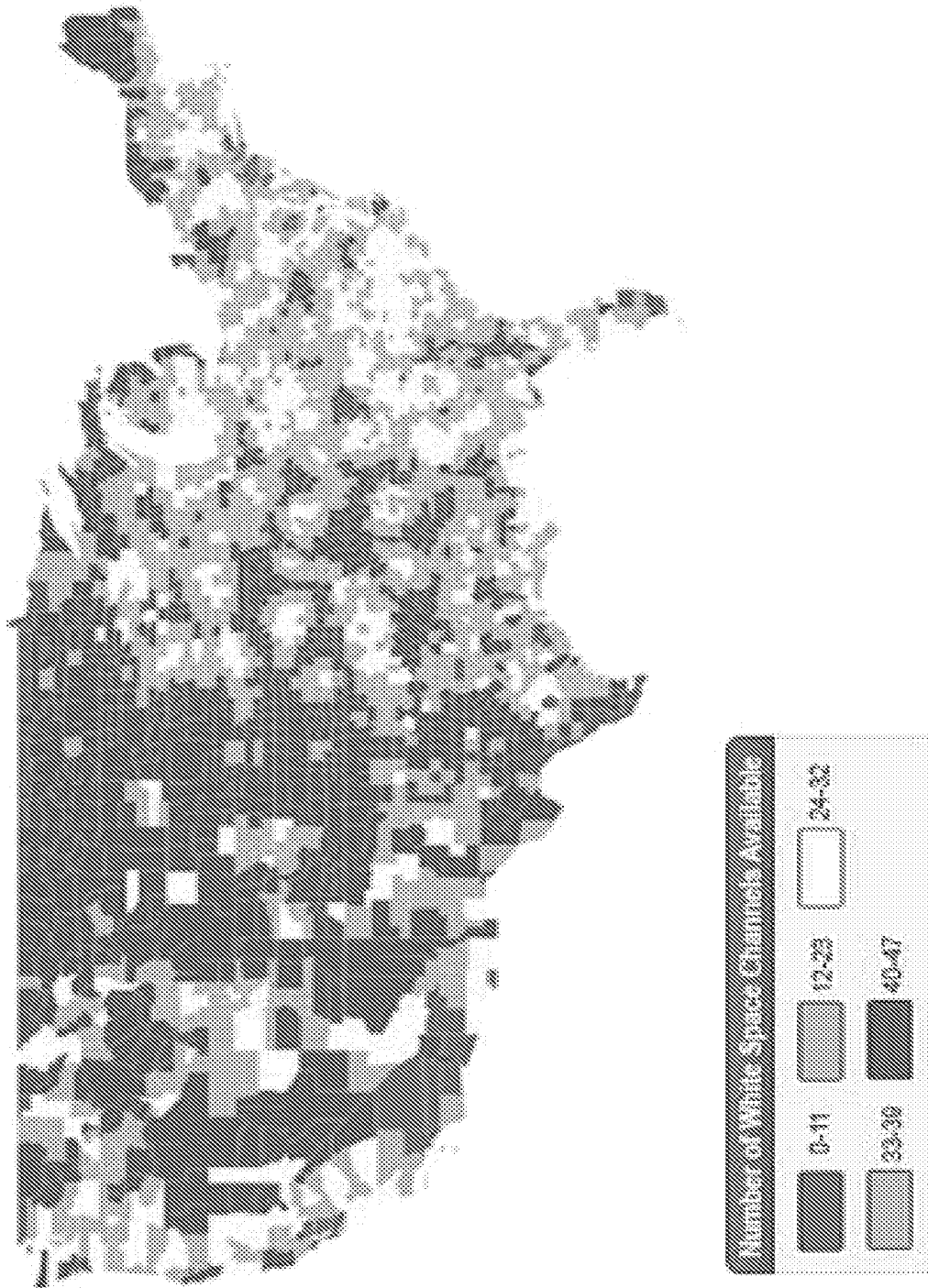


FIG. 3

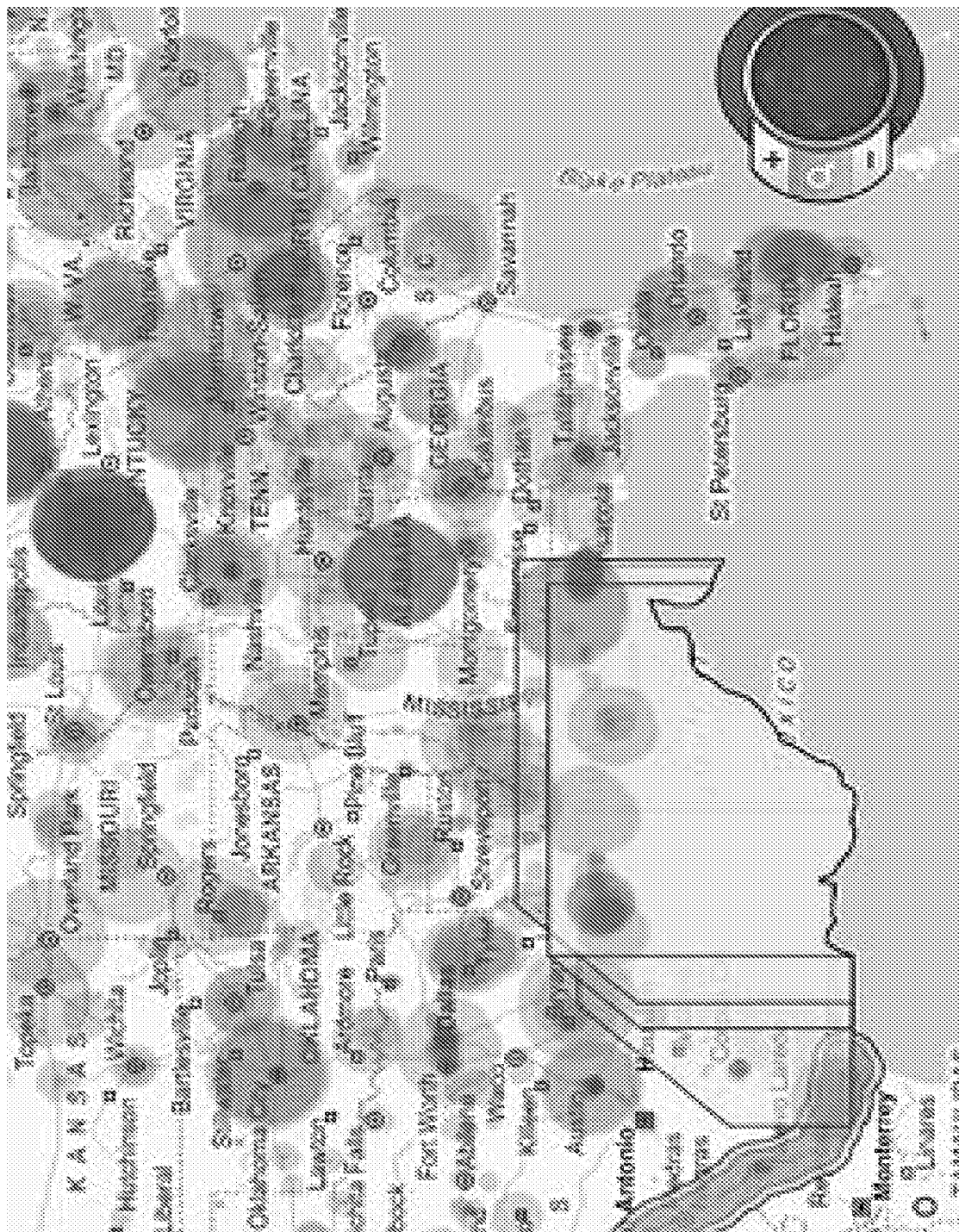


FIG. 4



Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	AUTOMATIC DEPENDENT SURVEILLANCE BROADCAST TRANSMISSION WITHIN WHITESPACE			
First Named Inventor/Applicant Name:	Paul Beard			
Filer:	Sean Patrick Suiter/Stephanie Swanson			
Attorney Docket Number:	MINIX 15-4-1			
Filed as Small Entity				
Filing Fees for Provisional				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Provisional Application Filing Fee	2005	1	130	130
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				130

Electronic Acknowledgement Receipt

EFS ID:	23296670
Application Number:	62209221
International Application Number:	
Confirmation Number:	8997
Title of Invention:	AUTOMATIC DEPENDENT SURVEILLANCE BROADCAST TRANSMISSION WITHIN WHITESPACE
First Named Inventor/Applicant Name:	Paul Beard
Customer Number:	23531
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Provisional Cover Sheet (SB16)	1541_ProvisionalCoversheet_08-24-15.pdf	1477020	no	3
			4e1a942a0bd32b85ec13565df7d619671314406f		
Warnings:					
Information:					
2	Application Data Sheet	1541_DataSheet_08-24-15.pdf	1560744	no	7
			435b29a8d1f134ff34e8cc25547e0c48769527df		
Warnings:					
Information:					
3	Specification	1541_ProvisionalApplicationFiled_08-24-15.pdf	50062	no	5
			8175cab62e569414312078640d4f381cc49ca5ce		
Warnings:					
Information:					
4	Drawings-other than black and white line drawings	1541_DrawingsFiled_08-24-15.pdf	145075	no	4
			7b7c3057c4992a23f13d163beb5f2010dba610c1		
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	30078	no	2
			a2c34c5845a7d7b097bb327fdce4d3fd53ec80a1		
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If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

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SCORE Placeholder Sheet for IFW Content

Application Number: 62209221

Document Date: 08/24/2015

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