



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
25.04.2007 Bulletin 2007/17

(51) Int Cl.:
H04H 1/00 (2006.01)

(21) Application number: **05077426.4**

(22) Date of filing: **20.10.2005**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(72) Inventors:
• **Wulfers, Marius Wilhelmus**
2396 HE Kouderkerk a/d Rijn (NL)
• **Busking, Erik Bert**
2564 TK Den Haag (NL)

(71) Applicant: **Nederlandse Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek TNO**
2628 VK Delft (NL)

(74) Representative: **Winckels, Johannes Hubertus F. et al**
Vereenigde Johan de Wittlaan 7
2517 JR Den Haag (NL)

(54) **Broadcast system**

(57) Method and system for transferring a local area radio or TV signal to a mobile radio or TV receiver which is set to receive a wide area radio or TV signal, when entering or residing in a certain local area. The system comprises means (1) for generating said local area signal, containing local area content which is different from the content of the wide area signal and means (2) for transmitting the local area signal using an RF field

strength which is sufficiently strong to override the RF field of the wide area signal in that local area. The system may comprise detection means (3), arranged to detect when the mobile receiver enters or resides in the local area, and means (3a) for starting the transmission of said local area content by means of said local area signal. The local area may mainly be situated within a room which at least partially shields the RF field of the wide area signal, e.g. a parking garage, a tunnel etc.

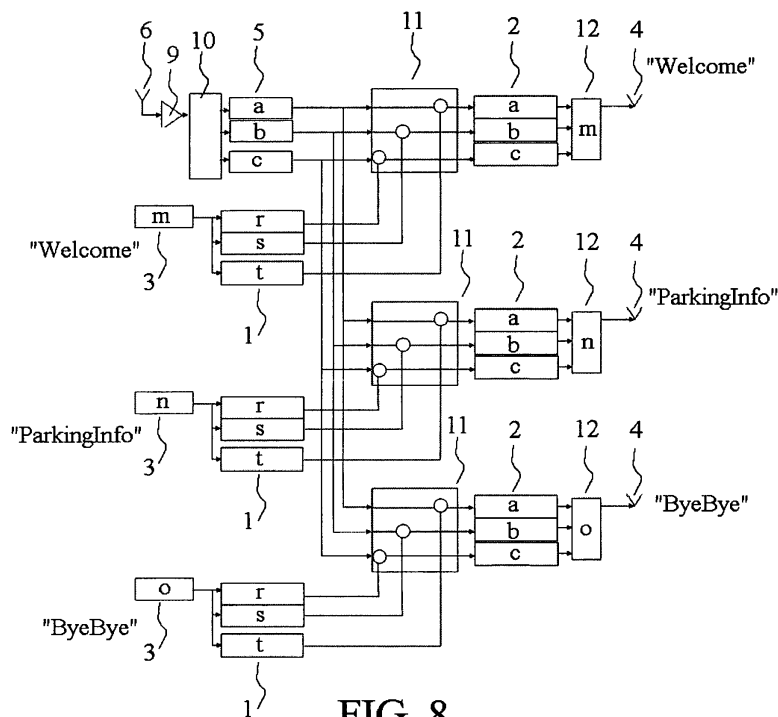


FIG. 8

Description

Field

[0001] The invention concerns a method for transferring a local area radio or TV signal (LAS) to a mobile radio or TV receiver which is set to receive a wide area radio or TV signal (WAS), when entering or residing in a certain local area.

Background

[0002] Generally known is that in e.g. tunnels re-transmission systems may be installed. As an antenna often a "leaky cable" is used. The radio (or TV) signals broadcasted outside the tunnel and picked up there are amplified and fed to the antenna where it is broadcasted inside the tunnel and can be received by passing vehicles. Thus the broadcast signals are simply relayed.

[0003] However a need may be felt not only to simply relay the radio broadcast signals to rooms in which the broadcast signals can not or hardly be received e.g. due to shielding effects of (reinforced concrete) walls, but, additionally, to transfer "local area content" to the car users, observing public broadcast radio or TV).

Summary

[0004] In order to meet said need for local area content (e.g. messages, music, TV clips etc.) the present invention presents a method for transferring local area radio or TV signals to a mobile radio or TV receiver which is arranged to receive a wide area radio or TV signal, when entering or residing in a certain local area, which method comprises that the local area signals are provided with local area content, which is different from the content of the wide area signal, and are transmitted using an RF field strength which is strong enough to dominate over, or to override the RF field of the wide area signals in that local area.

[0005] In this way a car user can receive, via the on-board receiver equipment e.g. messages which are deemed to be important or at least relevant or informative in view of the car user's neighbourhood and local circumstances. The local area content may comprise messages related to the local traffic or parking situation, or commercially interesting messages, e.g. within the parking garage of a shopping centre.

[0006] It is noted that outside the "time slots" during which (specific) local area content is transmitted which is different from the (generic) wide area content (e.g. content broadcasted by public radio), the local area RF signals may be used to simply relay the wide area content, as known from the prior art.

[0007] It may be preferred to detect at which moment the mobile receiver enters the relevant local area, after which the transmission of specific local area content by means of said local area signal can be started.

[0008] It may be preferred to use the present novel method at a local area which is mainly situated within a room - e.g. a tunnel or a garage - the enclosure of which at least partially shields the RF field of the wide area signal, due to which the field strength of the wide area signals will be relatively low. Note that means of prior art type may already have been installed for relaying the weakened wide area signals. However, the present method is not restricted to aforementioned situations. Also at locations where the wide area signals are not attenuated, (specific) local area signals may be broadcast locally to the mobile receivers, overriding the wide area signals, viz. when the local area signals are transmitted using an RF field strength which is sufficiently stronger than the RF field of the wide area signals in that local area, e.g. using one or more local antennas.

[0009] The present invention includes a system which comprises means which are arranged for performing the method outlined above. Hereinafter exemplary embodiments of such a system will be presented and discussed more in detail.

Exemplary Embodiment

[0010] In the various exemplary embodiments a system is arranged for transferring one or more local area radio or TV signal to one or more mobile radio or TV receivers (not shown in the figures) which are set to receive one or more wide area radio or TV signals, when entering or residing in a certain local area. Each system comprises means for generating one or more local area signals which comprise local area content, (partly) different from the content of the wide area signals. Those means comprise (an) audio generator(s) 1(a, b, etc.) and (an) RF transmitter(s) 2(a, b, etc.) for transmitting the local area signal(s) using an RF field strength which is sufficiently strong to override the RF field of the wide area signals in that local area.

[0011] Preferably - not necessary - the system comprises (a) detector(s) 3(m, n, o), which is/are arranged to detect the presence of the entity containing or carrying the mobile receiver in the local area, including controlling means 3a for starting the transmission of the local area content by means of said local area signals (RF carriers). Such entity e.g. is a vehicle e.g. car, truck or a (group of) person(s).

[0012] The local area may - or may not - be part of an enclosed area, of which the enclosure at least partially shields the RF field of the wide area (public radio/TV) signals, such enclosed area being e.g. a parking garage, a tunnel etc.

Figure 1 shows a first exemplary embodiment of a system which is arranged for performing the method outlined above.

Figure 2 shows a second exemplary embodiment of such an enabling system.

Figure 3 shows an alternative detail of the system

outlined in figure 2.

Figure 4 shows a third exemplary embodiment of an enabling system.

Figure 5 shows an extension of the system of figure 4.

Figure 6 shows a fourth exemplary embodiment of an enabling system.

Figure 7 shows a fifth exemplary embodiment of an enabling system.

Figure 8 shows a sixth exemplary embodiment of an enabling system.

[0013] Figure 1 shows an embodiment which comprises an audio generator 1 and an RF transmitter 2 - connected with antenna 4 - for transmitting a local area signal using an RF field strength which is sufficiently strong to override the RF field of the wide area signal in that local area. The content of the local area signal e.g. may be "Welcome to our shopping centre. Etc. etc." Preferably - not strictly necessary - the system comprises a detector 3 which is/are arranged for detecting the presence of a car - e.g. entering the parking garage of the shopping centre - and thus for detecting the presence of the entity containing or carrying the mobile receiver in the local area, including controlling means 3a (e.g. inside the detector 3), which controlling means are arranged for starting the transmission of the local area content by means of said local area signal via the RF transmitter 2 and antenna 4. In this most simple form, the system replaces one broadcast signal, containing (wide area) "received audio" by (local area) "local audio" at the same frequency. The signal that the car receives from the (wide area, public) broadcast station is overruled by the signal of the local transmitter 2 because - even though the RF signal of the local transmitter 2 is rather weak - its close proximity to the car in the local area and the shielding properties of the (underground) garage makes that the locally generated RF field strength will exceed the RF field of the broadcast station. The carrier frequency of the local transmitter 2 is equal to the carrier frequency of the public broadcast radio signal. The - optional - sensor 3 triggers the audio generator 1 and/or the transmitter 2 to generate the local content, intended for the car users, e.g. "Welcome", "Goodbye", or other message types). It is noted that the detector/sensor 3 could be based on e.g. an inductive loop, optical (PIR, light sensor, camera), acoustical, RF or radar.

[0014] A second exemplary embodiment, shown in figure 2, includes a wide area (public radio) signal receiver 5, connected with a receiving antenna 6 outside the premises and a switch 7. When the switch is in the top position, the received wide area (public) audio content of one broadcast station is relayed to the premises, viz. via the local transmitter 2 and local antenna 4 inside the premises. This will overcome any signal loss caused by shielding of the premises. However, when the switch 7 is brought into bottom position - e.g. triggered by means of the control means 3a inside the detector 3, the local

area signal is transmitted via transmitter 2 and antenna 4 to the car containing radio (or TV) receivers and residing inside the premises.

[0015] Figure 3 shows an alternative of the system outlined in figure 2. In this embodiment the content of the local area signal is modified by means of a signal adder 8, adding the local content to the wide area signal.

[0016] In the above embodiments only the broadcast signal received at one RF carrier frequency is replaced by (figure 2), viz. mixed with (figure 3) local content, transmitted at the same RF carrier frequency. In practice, however, there are several radio and TV stations, broadcasting at different (RF carrier) frequencies, so the system preferably needs to be extended in order to cover the majority of all cars in the premises, which may be set to receive different radio or TV broadcasts.

To replace (or mix) more signals, an expansion is necessary as outlined in figure 4. The output audio (or video) signals of several radio receivers 5 (a, b, etc.) - at their RF side connected to an external antenna 6 outside the premises, via an antenna amplifier 9 and an RF signal distributor 10 and tuned to different carrier frequencies f (a, b, etc.) - are supplied to a multiple audio adder 11, in which the local audio signal of the audio generator 1 is mixed with each individual LF signal from the various radio receivers 5. The mixed audio signals are supplied to several transmitters 2 (a, b, etc.) in which they are converted into several local area RF signals having (again) carrier frequencies f (a, b, etc.) thus overriding the original wide area RF signals. The transmitters 2 (a, b, etc.) are connected with one or more antennas 4 via an RF distributor 12.

[0017] In the foregoing each received wide area signal is mixed with the same local area content. However, it might be desired to have different local audio signals to be mixed with one or more wide area signals, as depicted in figure 5 in the most simple form. Figure 5 shows how two local audio signals r and s are mixed with the audio output signal a of one radio receiver 5a. The mixed signal (a + r + s) is supplied to the audio entry of the transmitter 2a. Both local audio signals may be mixed with the wide area audio signal a. However, signal r or signal s may be content-less (mute) at any moment. In other words either the local content of signal r or the local content of signal s may be mixed and in fact be broadcasted to the car users in the local area domain (the premises, tunnel, garage etc.).

[0018] Figure 6 shows a configuration in which multiple local audio signals r, s, etc. are mixed with multiple wide area signals a, b, etc. Figure 7 shows that some selected local audio channels r, s, etc. are combined with some selected received and re-transmitted audio channels a, b, etc. The purpose is, for example, to have a relaxed welcome message in a classical broadcast program and a more upbeat message in a rock program. (Note: It has to be realized that it is unknown to the system to which program each car radio/TV is tuned, so the messages have to be transmitted simultaneously.)

[0019] Figure 8 shows several transmitters 2 (a, b, c.) may be connected to different antennas, viz. via different RF distributors 12 (m, n, o, each connected with one antenna 4 (m, n, o). Of those antennas 4 (m, n, o) e.g. one antenna (4m) may cover the parking garage's entry area, transmitting "welcome" messages, a second antenna (4n) - or a group of antennas or a leaky cable antenna - may cover the parking route through the garage, transmitting guiding information to preferred parking zones in the garage, and a third antenna (4o) may cover the exit area and transmitting a "bye-bye" message. The transmission of the local area messages is started by means of the relevant detectors 3(m, n, o), triggering the relevant message generators 1(r, s, t) for the different RF channels a, b, c.

[0020] The transmitters could be pre-tuned to the different carrier frequencies of the broadcasted wide area radio channels. To avoid manual adjustment an automated receiver could be used, which detects and registers which carrier frequencies of the public broadcast stations can be received in the relevant local area. This frequency information can be conveyed to the transmitters, in order to be used to tune the radio receivers 5 (a, b, etc.), as well as the carrier generators of the respective transmitters 2 (a, b, etc.) automatically, viz. by setting their RF oscillator frequencies and tuning their input stages accordingly. Besides, the automated receiver also may detect and register the program type of the various radio programs, e.g. by means of registering their RDS code. Such a "kind-of program" code can be used to select the most appropriate message format of the different broadcast channels a, b and c.

[0021] It may be well known to the experts in the field that part of all aforementioned schematics and processes can be implemented digitally e.g. in Software Radio and/or Software Defined Radio architectures. This includes RF receiving, simultaneous demodulation, adding, message signal generation, transmitting etc., all in line with the principles of the invention.

[0022] It may be well known to the experts in the field that part of all aforementioned schematics and processes can be implemented following new broadcast standards e.g. DAB DVB with new modulation formats e.g. (C) OFDM, CDMA.

[0023] It may be well known to the experts in the field that in such modern radio systems the aforementioned concept of "tuning" will be partially or fully replaced by receive methods dedicated to such new communication systems, e.g. correlating or de-spreading with alternate keys, selecting specific time slots, hopping in different frequency hop patterns, combinations etc. and that any system operating as described in this document, as far as overriding or replacing remote broadcast content by local broadcast content is covered by this document.

[0024] It may be appreciated by the experts in the field that especially when the invented system is applied in tunnels, bridges and other logistic works, the described method serves to greatly improve safety, as instances

as e.g. smoke could obstruct driver's view of displays in or outside the driver's vehicle.

5 Claims

1. Method for transferring a local area radio or TV signal to a mobile radio or TV receiver which is set to receive a wide area radio or TV signal, when entering or residing in a certain local area, said method comprising that the local area signal comprises local area content which is different from the content of the wide area signal and that the local area signal is transmitted using an RF field strength which is sufficiently strong to override the RF field of the wide area signal in that local area.
2. Method according to claim 1, wherein is detected when an entity, containing or carrying the mobile receiver, enters or resides in the local area, after which transmission is started of said local area content by means of said local area signal.
3. Method according to claim 1, wherein the local area is mainly situated within an enclosure which at least partially shields the RF field of the wide area signal.
4. Method according to claim 1, comprising that the RF carrier frequency of each relevant wide area signal which can be received in the local area is detected and that the local area content is transmitted at an RF carrier frequency which is equal to one or more of said detected RF carrier frequencies.
5. System for transferring a local area radio or TV signal to a mobile radio or TV receiver which is set to receive a wide area radio or TV signal, when entering or residing in a certain local area, the system comprising means (1) for generating said local area signal, including local area content which is different from the content of the wide area signal and means (2) for transmitting the local area signal using an RF field strength which is sufficiently strong to override the RF field of the wide area signal in that local area.
6. System according to claim 5, comprising detection means (3), arranged to detect when an entity containing or carrying the mobile receiver enters or resides in the local area, and means (3a) for starting the transmission of said local area content by means of said local area signal.
7. System according to claim 5, wherein the local area is mainly situated within an enclosure which at least partially shields the RF field of the wide area signal.
8. System according to claim 5, comprising an automated receiver comprising means which are ar-

ranged to detect and register which RF carrier frequencies of the public broadcast stations can be received in the relevant local area, as well as means which are arranged for setting the RF carrier frequency of said means (2) for transmitting the local area signal accordantly. 5

10

15

20

25

30

35

40

45

50

55

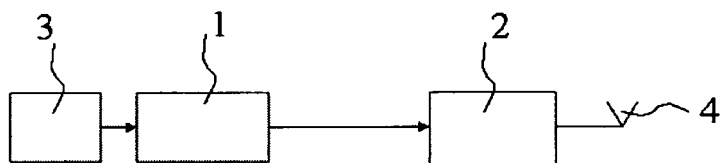


FIG. 1

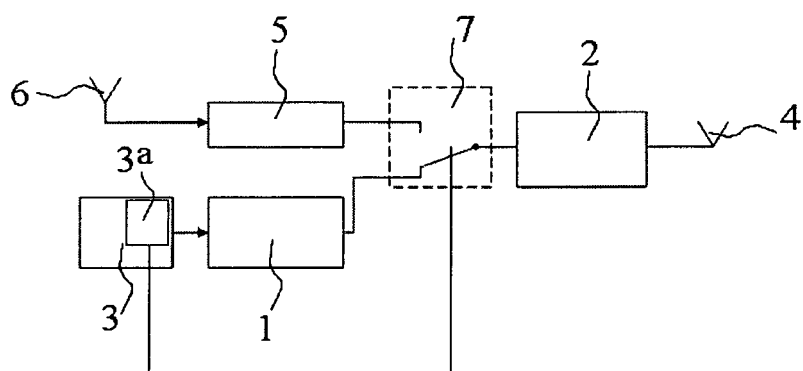


FIG. 2

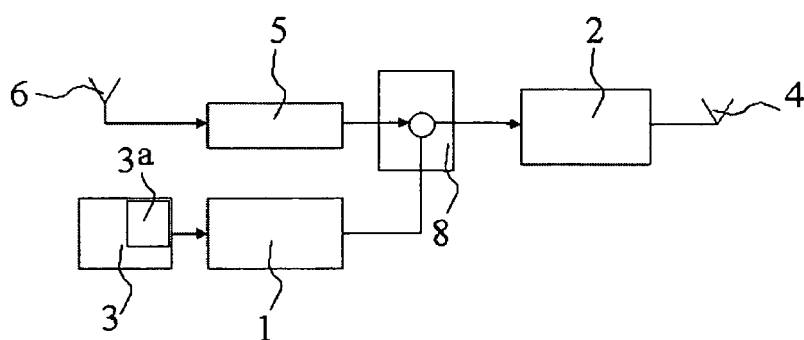


FIG. 3

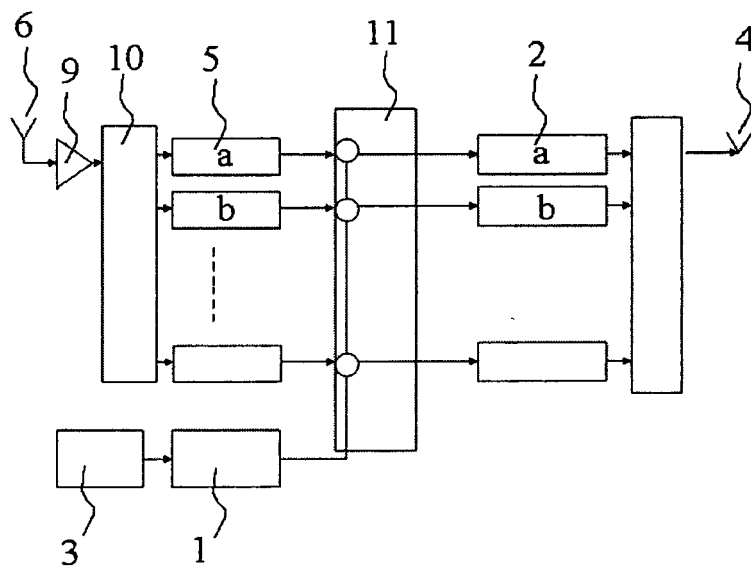


FIG. 4

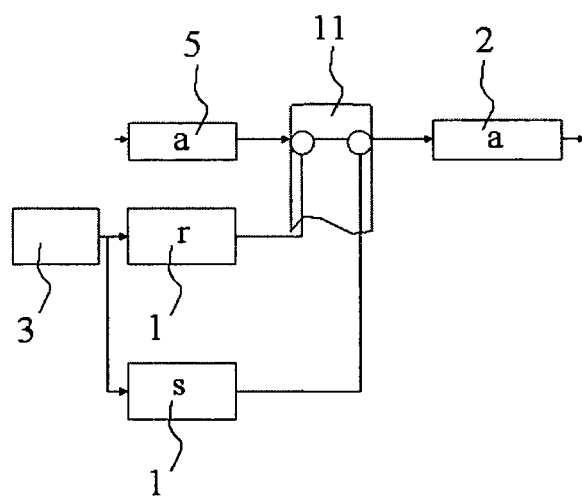
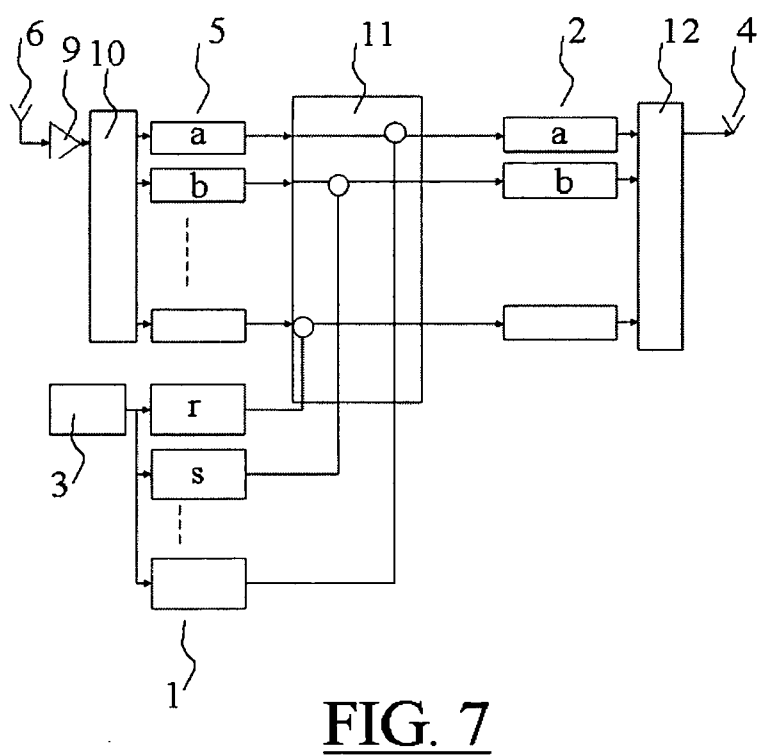
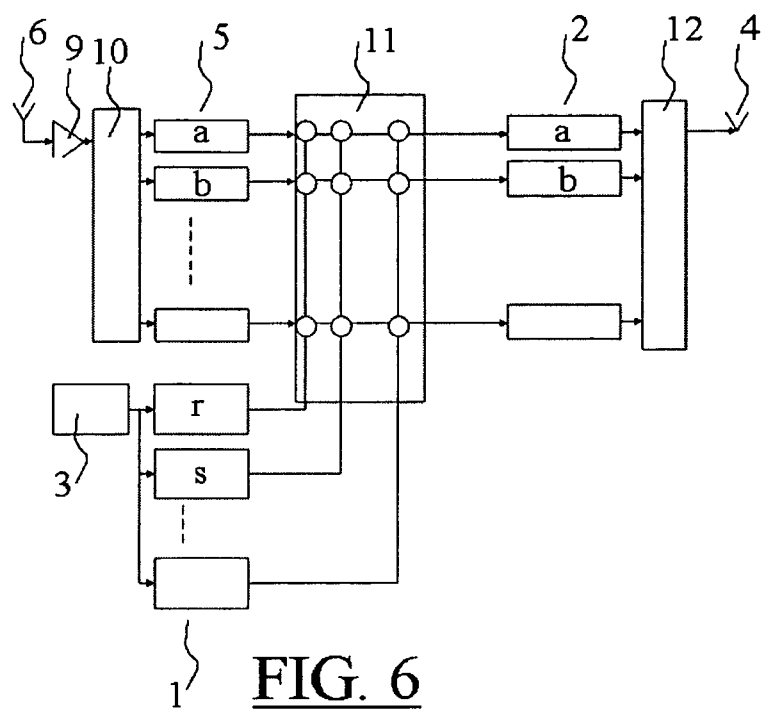
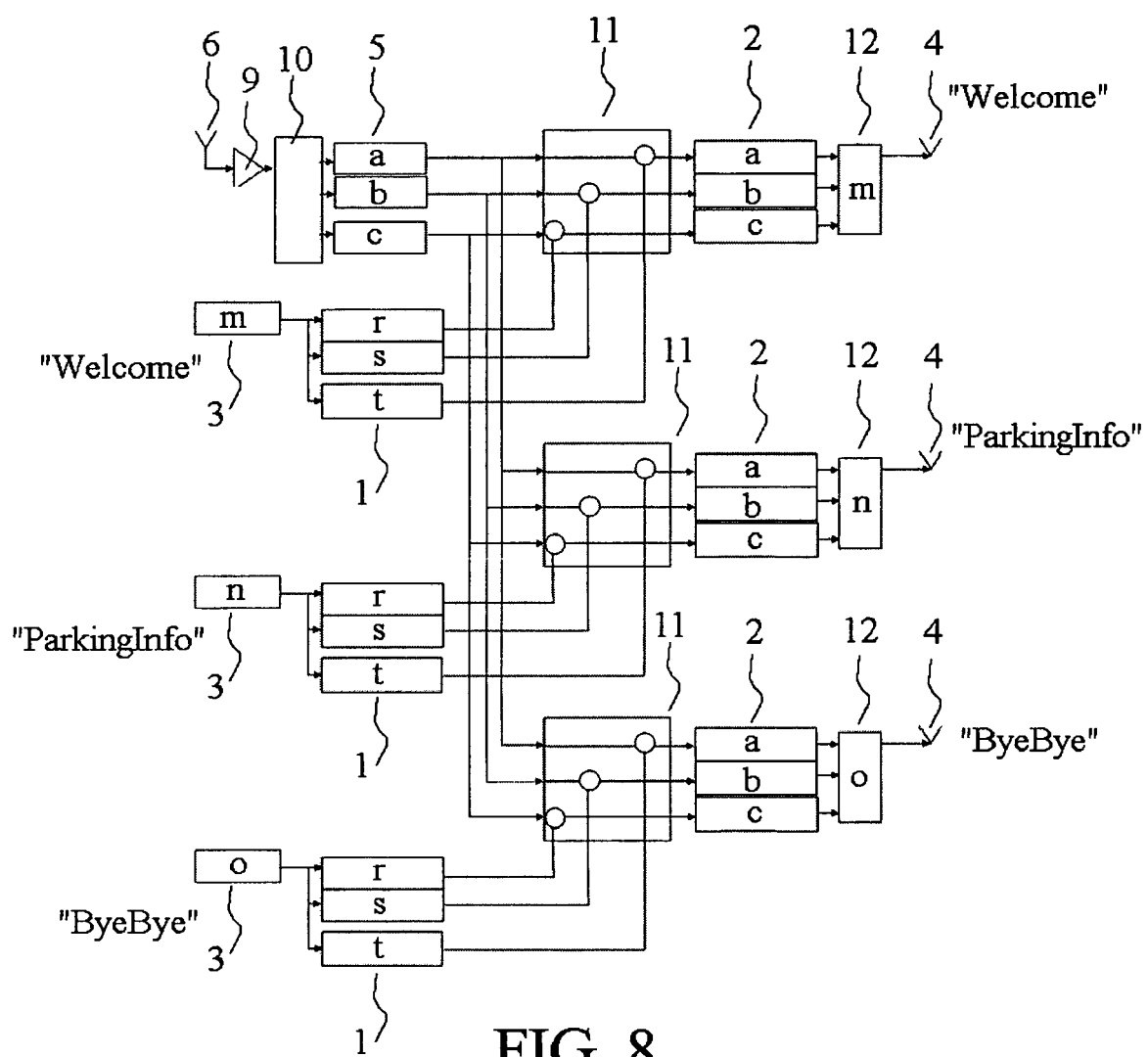


FIG. 5







European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 07 7426

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 5 471 642 A (PALMER ET AL) 28 November 1995 (1995-11-28)	1,3-5,7,8	H04H1/00
Y	* column 1, lines 43-47 * * column 3, lines 8-10 * * column 3, lines 16-23 * * column 4, lines 17-23 * * column 4, lines 30-37 * * column 5, lines 34-37 *	2,6	
Y	----- US 5 133 081 A (MAYO ET AL) 21 July 1992 (1992-07-21) * column 9, lines 10-14 *	2,6	
X	----- FR 2 693 610 A (BY DIRECT) 14 January 1994 (1994-01-14) * page 3, line 22 - page 4, line 24 * * page 5, line 35 - page 6, line 1 *	1,3-5,7,8	
			TECHNICAL FIELDS SEARCHED (IPC)
			H04H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 29 March 2006	Examiner Pantelakis, P
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 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 07 7426

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.

29-03-2006

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5471642	A	28-11-1995	NONE	

US 5133081	A	21-07-1992	NONE	

FR 2693610	A	14-01-1994	NONE	
