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NOTICE OF ENTITLEMENT

I, Gustaaf J.C. DE HEER

Australian Application No. 61261/96

of c/o KPN Intellectual Property Group
Prinses Beatrixlaan 16, 2595 AL, THE HAGUE
The Netherlands

being authorised by the Applicant(s)/Nominated Person(s) in respect of an application entitled:

Ground-station system, ground station, device, method

state the following:-

1. The Applicant(s)/Nominated Person(s) has/have, for the following reasons, gained entitlement from the actual inventor(s):- The Applicant(s)/Nominated Person(s), by virtue of a Contract of Employment between the actual inventor(s) as employee(s) and the Applicant(s)/Nominated Person(s) as employer(s), is a person entitled to have the patent assigned to it if a patent were granted on an application made by the actual inventor(s).

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3.* The basic application(s) listed ~~*on the Patent Request~~/ *in the Declaration under Article 8 of the PCT is/are the application(s) first made in a Convention Country in respect of the invention.

4a.* ~~The Applicant(s)/Nominated Person(s) is/are the depositor(s) of the deposit(s) listed in the Schedule hereto~~.

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DATED this 11 th day of November 19 97

(Signature)

(Name & ~~Title~~)
Gustaaf J.C. DE HEER
Authorized Employee of
KONINKLIJKE PTT NEDERLAND N.V.

* Delete if not applicable.

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(71) Applicant(s)
KONINKLIJKE PTT NEDERLAND N.V.

(72) Inventor(s)
JOHANNES JOZEPH MAATMAN; PETER ZIJLEMA

(74) Attorney or Agent
SPRUSON & FERGUSON , GPO Box 3898, SYDNEY NSW 2001

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(57) Claim

1. Ground-station system comprising a first ground station (1) which is provided with

- at least one first aerial (2) for the reception of a first satellite signal comprising an identification code,
- a first processing arrangement (3) comprising a first input, coupled to the first aerial (2), for the reception and processing of the first satellite signal and comprising a first output for the generation of a first outgoing signal, and
- a first detection arrangement (4,5) for detecting the identification code,

and comprising a second ground station which is provided with

- at least one second aerial for the reception of a second satellite signal comprising an identification code,
- a second processing arrangement comprising a second input, coupled to the second aerial, for the reception and processing of the second satellite signal and comprising a second output for the generation of a second output signal, and
- a second detection arrangement for detecting the identification code,

characterized in that the first detection arrangement (4,5) is provided with a first through-coupling arrangement (6) for through-

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coupling the first aerial (2) to the first processing arrangement (3) in response to an identification code of a first type and for through-coupling the first aerial (2) to a further second input of the second processing arrangement via a first link (27) in response to an identification code of a second type.

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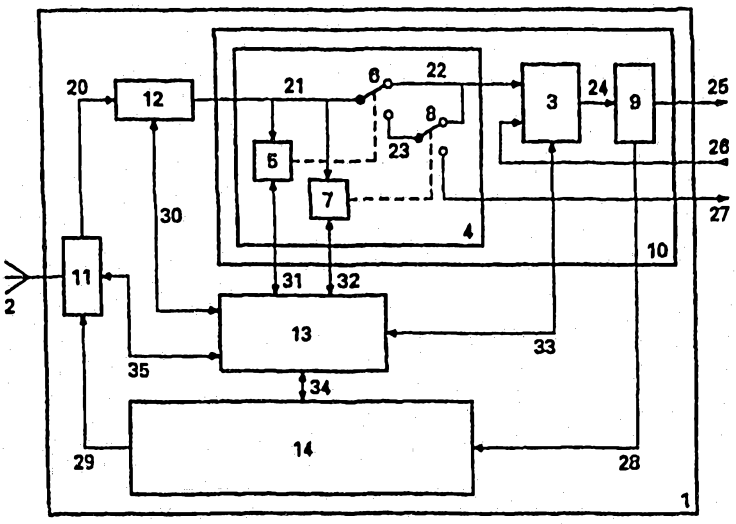
(71) Applicant *(for all designated States except US)*: KONINKLIJKE PTT NEDERLAND N.V. [NL/NL]; Stationsplein 7, NL-9726 AE Groningen (NL).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: MAATMAN, Johannes, Jozeph [NL/NL]; Leuvensestraat 1, NL-2587 GA The Hague (NL). ZIJLEMA, Peter [NL/NL]; Watertuin 64, NL-2362 XD Warmond (NL).

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(57) Abstract

Known ground-station systems offer users of mobile stations a different standard procedure for each ground station. By through-coupling an aerial of the ground station to a processing arrangement of the ground station in response to a first identification code, satellite signal comprising the first identification code being processed via the processing arrangment of said ground station,, and by through-coupling the aerial via a link to another processing arrangement of another ground station in response to a second identification code, satellite signals comprising the second identification code not being processed via the processing arrangement of said ground station, but only being transmitted by the ground station via the link to the other processing arrangement of the other ground station in order to be processed subsequently by said other processing arrangement at the site of the other ground station, the result is achieved that a user of a mobile station deals with one standard procedure over the entire world and a "global image" is created.

Ground-station system, ground station, device, method

A Background of the invention

The invention relates to a ground-station system comprising a first ground station which is provided with

- at least one first aerial for the reception of a first satellite signal comprising an identification code,
- a first processing arrangement comprising a first input, coupled to the first aerial, for the reception and processing of the first satellite signal and comprising a first output for the generation of a first outgoing signal, and
- a first detection arrangement for detecting the identification code,

and comprising a second ground station which is provided with

- at least one second aerial for the reception of a second satellite signal comprising an identification code,
- a second processing arrangement comprising a second input, coupled to the second aerial, for the reception and processing of the second satellite signal and comprising a second output for the generation of a second outgoing signal, and
- a second detection arrangement for detecting the identification code.

Such a ground-station system is generally known and makes use, for example, of four satellites which are each situated at such a height above the earth's surface and are each situated at such a degree of longitude and degree of latitude that an attempt can be made to contact at least one of the four satellites from virtually any terrestrial location, and in which the total of the four satellites can try to contact with virtually any terrestrial location. From certain terrestrial locations, of course, contact can be sought with more than one satellite, such as two or even three satellites, and preferably, a ground station will be sited at such a certain location.

The first ground station of a first operator is then situated in a first country and can try to contact, for example, the first, second and third satellite, said first ground station then having control over three first aerials. A first mobile station situated within the

range of the first, second or third satellite in that case transmits the first satellite signal comprising a first identification code, such as, for example, a first ground-station identification code, to the first, second or third satellite which passes said first satellite signal comprising the first ground-station identification code, to the first ground station. The first satellite signal, comprising the first ground-station identification code and received via one of the three first aerials, is processed via the first processing arrangement, in response to which the first outgoing signal is generated. Under these circumstances, the first detection arrangement detects said first ground-station identification code, from which it then emerges that said first satellite signal, comprising the first ground-station identification code, is intended for said first ground station.

The second ground station of a second operator is then situated in a second country and can try to contact, for example, the third and fourth satellite, said second ground station then having control over two second aerials. A second mobile station situated within the range of the third or fourth satellite in that case transmits the second satellite signal, comprising a second identification code, such as, for example, a second ground-station identification code, to the third or fourth satellite which passes said second satellite signal, comprising the second ground-station identification code, to the second ground station. The second satellite signal, comprising the second ground-station identification code and received via one of the two second aerials, is processed via the second processing arrangement, in response to which the second outgoing signal is generated. Under these circumstances, the second detection arrangement detects said second ground-station identification code, from which it then emerges that said second satellite signal, comprising the second ground-station identification code, is intended for said second ground station.

If the user with his mobile station is situated, for example, within the range of the third satellite, he can generate either the first satellite signal, comprising the first ground-station identification code, or the second satellite signal, comprising the second ground-station identification code. In this case, the first ground station then responds, after detecting the first ground-station identification code, to the first satellite signal and the second

ground station responds, after detecting the second ground-station identification code, to the second satellite signal. On the other hand, if the user with his mobile station is situated, for example, within the range of the fourth satellite, he must generate per se the second satellite signal, comprising the second ground-station identification code, in which case the second ground station responds, after detecting the second ground-station identification code, to said second satellite signal.

Such a ground-station system has, inter alia, the disadvantage that a user of a mobile station cannot manage according to one standard procedure over the entire world, but has to deal instead with a standard procedure which is different for each ground station.

B Summary of the invention

The object of the invention is, inter alia, to provide a ground-station system of the type mentioned in the introduction, in which a user of a mobile station has to deal with one standard procedure over the entire world.

For this purpose, the ground-station system according to the invention has the characteristic that the first detection arrangement is provided with a first through-coupling arrangement for through-coupling the first aerial to the first processing arrangement in response to an identification code of a first type and for through-coupling the first aerial to a further second input of the second processing arrangement via a first link in response to an identification code of a second type.

By providing the first detection arrangement with the first through-coupling arrangement which through-couples the first aerial to the first processing arrangement in response to the identification code of the first type (such as, for example, the ground-station identification code of the first type) and which through-couples the first aerial to the further second input of the second processing arrangement via the first link in response to the identification code of the second type (such as, for example, the ground-station identification code of the second type), the result is achieved that, if the first ground station situated in a first country responds to first satellite signals, comprising the identification code of the

first type (such as, for example, the ground-station identification code of the first type), said first satellite signals are consequently also actually processed via the first processing arrangement of said first ground station, whereas, if the first ground station responds to first satellite signals, comprising the identification code of the second type (such as, for example, the ground-station identification code of the second type), said first satellite signals, are not processed via the first processing arrangement of said first ground station, but are only transmitted by the first ground station via the first link to the second processing arrangement of the second ground station situated in a second country in order to be processed subsequently by said second processing arrangement at the site of the second ground station. In this case, the first link between the first ground station and the second ground station is a communication connection which can be formed, for example, by means of copper connections and/or glass-fibre connections and/or satellite connections and/or terrestrial radio connections.

The invention is based, inter alia, on the insight that, regardless of whether they comprise identification codes, such as, for example, ground-station identification codes, of the first or the second type, message-switched satellite signals, for example, can be received via a first aerial of a first ground station, in which case said satellite signals should generally be processed at the site of the first ground station if they comprise identification codes of the first type (such as, for example, ground-station identification codes of the first type), whereas said satellite signals can generally be transmitted without processing at the site of the first ground station via the first link to the second ground station in order to be processed there at the site, if they comprise identification codes of the second type (such as, for example, ground-station identification codes of the second type).

The problem of the user of a mobile station having to deal with a different standard procedure for each ground station is solved by processing the satellite signals either directly after reception at the site of a first ground station or indirectly after reception by the first ground station and after transmission to, and reception by, a second ground station at the site of the latter, depending on an identification code to be detected, such as, for example, a ground-

station identification code.

Further advantages of the ground-station system according to the invention are the ability of one particular operator to create a so-called "global image" because a user of a mobile station can now manage with one ground-station identification code over the entire world and, to be specific, according to one standard procedure instead of a different standard procedure for each ground station. In addition, the ground-station system according to the invention offers an operator the possibility of providing a user with the same possibilities over the entire world, even in areas which were hitherto regarded as being territories of other operators, which will promote competition and will considerably reduce the dependence of an operator on other operators.

It should be pointed out that the possibilities also include, of course, also providing the first ground station with a further second processing arrangement so that satellite signals, comprising identification codes of the second type, such as, for example, ground-station identification codes of the second type, can also be processed at the site of the first ground station before they are transmitted via the first link. A disadvantage of this is the additional costs of the further second processing arrangement. It should, furthermore, be pointed out that, although known ground stations detect the ground-station identification codes associated with satellite signals, they do so only for the purpose of determining whether said satellite signals should be examined more closely or should be ignored. On the other hand, ground-stations according to the invention detect said ground-station identification codes associated with satellite signals for the purpose of determining whether said satellite signals should be processed or should be transmitted to other ground stations without processing. From this there emerges yet a further advantage of the ground-station system according to the invention, which makes use of the aerials of the ground stations in a more efficient way.

The ground-station system according to the invention, furthermore, offers at least two possibilities. Firstly, the identification code could correspond to the ground-station identification code, as already proposed above, and such as, for example, a LESID (local earth station identification code), in which case the user of a mobile station no longer needs to be acquainted

with the information about the ground station via which communication should take place because such a user could then use the same ground-station identification code everywhere in the world. In that case, if the user is situated with his mobile station, for example, within the range of the first and/or the second satellite (which first and second satellite can contact only the first gr und station situated in the first country), consequently he can now generate the first satellite signal, comprising the second ground-station identification code, in which case said first ground station responds to said first satellite signal after detecting the second ground-station identification code and in which case said first satellite signal is not processed via the first processing arrangement of said first ground station, but is only transmitted by the first ground station via the first link to the second processing arrangement of the second ground station in order to be processed subsequently by said second processing arrangement at the site of the second ground station. Secondly, the identification code could correspond to a mobile-station identification code, such as, for example, a MESID (mobile earth station identification code), in which case the user of a mobile station may still have to generate the correct ground-station identification code, but the desired ground station (and the desired processing arrangement associated therewith) is then selected on the basis of the mobile-station identification code. In this case, if the user is situated with his mobile station, for example, within the range of the first and/or the second satellite, consequently he can now generate the first satellite signal, which may comprise the first ground-station identification code and always comprises a second mobile-station identification code, in which case the first ground station responds to said first satellite signal after detecting the second mobile-station identification code and in which case said first satellite signal is not processed via the first processing arrangement of said first ground station, but is only transmitted by the first ground station via the first link to the second processing arrangement of the second ground station in order to be processed subsequently by said second processing arrangement at the site of the second ground station. Although a user of a mobile station may now therefore no longer be able to manage with one ground-station identification code over the entire world, he is still able to do so according to one standard

procedure instead of a different standard procedure for each ground station. This second possibility (which will be chosen, for example, if a satellite controller does not agree to, or does not agree to in the interim, the first possibility) requires, for example, reference to a first internal table of the first ground station, a first portion of which first internal table is regularly updated, for example, via a network-coordinating station and a second portion of which first internal table can be loaded by an operator or a user of a mobile station with the required information, or requires, for example, reference by the first ground station to a first external table which is situated, for example, in the network-coordinating station. Such first tables have, for example, a left-hand column (for example the first portion) containing mobile-station identification codes and a right-hand column (for example the second portion) containing corresponding ground-station identification codes or operator codes. It goes without saying that both possibilities could also be combined, for example, by dealing with satellite signals originating from the first and second satellite in accordance with the first possibility and, for example, by dealing with signals originating from the third satellite (which third satellite can contact both the first ground station situated in the first country and the second ground station situated in the second country) in accordance with the second possibility. Furthermore, both possibilities could be combined, for example, by dealing with satellite signals originating from the first and second satellite in accordance with the first and/or the second possibility and, for example, by dealing with signals originating from the third satellite in accordance with the procedure already known.

A first embodiment of the ground-station system according to the invention has the characteristic that the first satellite signal comprises a destination code, the first ground station being provided with

- a further first detection arrangement for detecting the destination code,
- a further first through-coupling arrangement for through-coupling the first aerial to the first processing arrangement in response to a destination code of a first type and for through-coupling the first aerial to the further second input of the second processing arrangement via the first link in response to a destination

code of a second type.

By providing the first ground station with the further first detection arrangement which detects the destination code associated with the first satellite signal and with the further first through-coupling arrangement which through-couples the first aerial to the first processing arrangement in response to the destination code of the first type and which through-couples the first aerial to the further second input of the second processing arrangement via the first link in response to the destination code of the second type, the result is achieved that the first ground station first of all investigates which further user the first satellite signal is destined for before said first satellite signal is processed or transmitted. This includes destination codes of the first type, for example, in the case of users having mobile stations who are situated within the range of the first ground station and it includes destination codes of the second type, for example, in the case of users having mobile stations who are situated outside the range of the first ground station. As a consequence of this, first satellite signals comprising identification codes of the second type and comprising destination codes of the first type are not actually transmitted via the first link to the second processing arrangement, but, on the contrary, are actually processed by the first processing arrangement. This has the advantage that traffic between two users of mobile stations who are both situated within the range of the first ground station, but whose calling user generates the identification code of the second type associated with the second ground station is actually processed at the site of the first ground station, which avoids excessive to-and-fro traffic via links.

Destination codes of the first type could also be associated, for example, with fixed terminals which are connected to a fixed terrestrial network and which are situated nearer the first ground station, and destination codes of the second type could be associated, for example, with fixed terminals which are connected to a fixed terrestrial network and which are situated nearer the second ground station. As a consequence of this, first satellite signals comprising identification codes of the second type and comprising destination codes of the first type are not actually transmitted via the first link to the second processing arrangement, but, on the contrary, are

actually processed by the first processing arrangement. This has the advantage that traffic between a user of a mobile station and a fixed terminal situated nearer the first ground station is actually processed at the site of the first ground station, while the calling user generates the identification code of the second type associated with the second ground station, which avoids excessive to-and-fro traffic via links.

In this case, the destination code is detected by the further first detection arrangement of the first ground station, for example, by reference to a second internal table of the first ground station, which second internal table is regularly updated, for example, via the network-coordinating station, or, for example, by reference to a second external table by the first ground station, which second external table is situated, for example, in the network-coordinating station.

Preferably, the first ground station will detect destination codes associated with first satellite signals transmitted via the first satellite and destination codes associated with second satellite signals transmitted via the second satellite, and the second ground station will detect destination codes associated with fourth satellite signals transmitted via the fourth satellite. As regards third satellite signals to be transmitted via the third satellite which are either transmitted to the first ground station or to the second ground station, there is, of course, the advantageous possibility of allowing both ground stations to detect the destination codes, although, in this case, another advantageous possibility could be not to do precisely this.

A second embodiment of the ground-station system according to the invention has the characteristic that the second detection arrangement is provided with a second through-coupling arrangement for through-coupling the second aerial to the second processing arrangement in response to an identification code of a second type and for through-coupling the second aerial to a further first input of the first processing arrangement via a second link in response to an identification code of a first type.

By providing the second detection arrangement with the second through-coupling arrangement which through-couples the second aerial to the second processing arrangement in response to the identification

code of the second type and which through-couples the second aerial to the further first input of the first processing arrangement via the second link in response to the identification code of the first type, the result is achieved that, if the second ground station responds to second satellite signals comprising the identification code of the second type (such as, for example, the ground-station identification code of the second type), said second satellite signals are consequently actually processed via the second processing arrangement of said second ground station, whereas, if the second ground station responds to second satellite signals comprising the identification code of the first type (such as, for example, the ground-station identification code of the first type), said second satellite signals are not processed via the second processing arrangement of said second ground station, but are only transmitted by the second ground station via the second link to the first processing arrangement of the first ground station in order to be processed subsequently by said first processing arrangement at the site of the first ground station. In this case, the second link between the first ground station and the second ground station is a communication connection which can be formed, for example, by means of copper connections and/or glass-fibre connections and/or satellite connections and/or terrestrial radio connections.

A third embodiment of the ground-station system according to the invention has the characteristic that the second satellite signal comprises a destination code, the second ground station being provided with

- a further second detection arrangement for detecting the destination code,
- a further second through-coupling arrangement for through-coupling the second aerial to the second processing arrangement in response to a destination code of a first type and for through-coupling the second aerial to the further first input of the first processing arrangement via the second link in response to a destination code of a second type.

By providing the second ground station with the further second detection arrangement which detects the destination code associated with the second satellite signal, and with the further second through-coupling arrangement which through-couples the second aerial to the

second processing arrangement in response to the destination code of the first type and which through-couples the second aerial to the further first input of the first processing arrangement via the second link in response to the destination code of the second type, the result is achieved that the second ground station first of all investigates which further user the second satellite signal is destined for before said second satellite signal is processed or is transmitted. In this case, destination codes of the first type are associated, for example, with users having mobile stations who are situated within the range of the second ground station and destination codes of the second type are associated, for example, with users having mobile stations who are situated outside the range of the second ground station. As a consequence of this, second satellite signals, comprising identification codes of the first type and comprising destination codes of the first type, are not actually transmitted via the second link to the first processing arrangement, but, on the contrary, are actually processed by the second processing arrangement. This has the advantage that traffic between two users of mobile stations who are both situated within the range of the second ground station, but whose calling user generates the identification code of the first type associated with the first ground station is actually processed at the site of the second ground station, which avoids excessive to-and-fro traffic via links. In this case, the destination code is detected by the further second detection arrangement of the second ground station, for example, by reference to a third internal table of the second ground station, of which third internal table a first portion is regularly updated, for example, via the network-coordinating station and of which third internal table a second portion can be loaded with the required information, for example, by an operator or a user of a mobile station, or for example, by reference to a third external table by the second ground station, which third external table is situated, for example, in the network-coordinating station.

It goes without saying that the internal tables present in a ground station may coincide to a greater or lesser degree and the external tables present in a network-coordinating station may coincide to a greater or lesser degree.

The invention, furthermore, relates to a ground station for use

in a ground-station system and provided with

- at least one aerial for the reception of a satellite signal comprising an identification code,
- a processing arrangement comprising an input, coupled to the aerial, for the reception and processing of the satellite signal and comprising an output for the generation of a first outgoing signal, and
- a detection arrangement for detecting the identification code.

The ground station according to the invention has the characteristic that the detection arrangement is provided with a through-coupling arrangement for through-coupling the aerial to the processing arrangement in response to an identification code of a first type and for through-coupling the aerial to a link coupled to a further ground station for feeding at least one portion of the satellite signal to said further ground station in response to an identification code of a second type.

A first embodiment of the ground station according to the invention has the characteristic that the satellite signal comprises a destination code, the ground station being provided with

- a further detection arrangement for detecting the destination code,
- a further through-coupling arrangement for through-coupling the aerial to the processing arrangement in response to a destination code of a first type and for through-coupling the aerial to the link coupled to the further ground station in response to a destination code of a second type.

The invention, furthermore, relates to a device for use in a ground station provided with an aerial for the reception of a satellite signal comprising an identification code, which device is provided with

- a processing arrangement comprising an input which can be coupled to the aerial for the reception and processing of the satellite signal and comprising an output for the generation of a first outgoing signal, and
- a detection arrangement for detecting the identification code.

The device according to the invention has the characteristic that the detection arrangement is provided with a through-coupling arrangement for through-coupling the aerial to the processing

arrangement in response to an identification code of a first type and for through-coupling the aerial to a link coupled to a further ground station for feeding at least a portion of the satellite signal to said further ground station in response to an identification code of a second type.

A first embodiment of the device according to the invention has the characteristic that the satellite signal comprises a destination code, the device being provided with

- a further detection arrangement for detecting the destination code, and
- a further through-coupling arrangement for through-coupling the aerial to the processing arrangement in response to a destination code of a first type and for through-coupling the aerial to the link coupled to the further ground station in response to a destination code of a second type.

The invention also relates, furthermore, to a method for processing a satellite signal originating from a satellite by a ground station, which method comprises the steps of

- the reception of the satellite signal comprising an identification code via an aerial of the ground station,
- the feeding of the satellite signal to a processing arrangement of the ground station,
- the processing of the satellite signal by the processing arrangement of the ground station and generation of a first outgoing signal, and
- the detection of the identification code by a detection arrangement of the ground station.

The method according to the invention has the characteristic that the method comprises the steps of

- the through-coupling of the aerial of the ground station to the processing arrangement of the ground station in order to process the satellite signal via the processing arrangement of the ground station in response to an identification code of a first type, and
- the through-coupling of the aerial of the ground station to a link coupled to a further ground station for feeding at least a portion of the satellite signal to said further ground station in order to process at least the portion of the satellite signal via a further processing arrangement of the further ground station in

response to an identification code of a second type.

A first embodiment of the method according to the invention has the characteristic that the method comprises the steps of

- the detection of a destination code associated with the satellite signal by a further detection arrangement of the ground station,
- the through-coupling of the aerial of the ground station to the processing arrangement of the ground station in order to process the satellite signal via the processing arrangement of the ground station in response to a destination code of a first type, and
- the through-coupling of the aerial of the ground station to the link coupled to the further ground station for feeding at least the portion of the satellite signal to said further ground station in order to process at least the portion of the satellite signal via the further processing arrangement of the further ground station in response to a destination code of a second type.

From WO 92/19050 a global satellite communication system with geographic protocol conversion is known. This document substantially discloses the transmitting of messages to mobile users. Therefore, the invention relating to the transmitting of signals from a mobile user via a satellite to a ground station is not known from this document.

C References

- WO 92/19050
- WO 92/00636
- GB 2 275588

All references are deemed to have been incorporated in this patent application.

D Exemplary embodiment

The invention will be explained in greater detail by reference to an exemplary embodiment shown in the figure. In the figure:

Figure 1 shows a ground station according to the invention for

use in a ground-station system according to the invention and comprising a device according to the invention.

The ground station 1 shown in Figure 1 comprises an aerial 2 which is coupled to a transceiver 11, of which a reception output is coupled via a connection 20 to an input of a demodulator 12 and of which a transmission input is coupled via a connection 29 to an output of a modulator 14. A control input/output of transceiver 11 is coupled via a control connection 35 to a processor 13 which is coupled via a control connection 30 to a control input/output of demodulator 12 and which is coupled via a control connection 34 to a control input/output of modulator 14. An output of demodulator 12 is coupled via a connection 21 to an input of a device 10, a first output of which can be coupled via a connection 25 to a terrestrial network not shown in Figure 1 and a second output of which is coupled via a connection 28 to an input of modulator 14 and a link input of which can be coupled via link 26 to another ground station not shown in Figure 1 and a link output of which can be coupled via a link 27 to the other ground station not shown in Figure 1 and a first or second or third control input/output of which is coupled via a control connection 31 or 32 or 33, respectively, to processor 13.

Device 10 comprises a detection arrangement 4 and a processing arrangement 3 and a switch 9. Detection arrangement 4 is provided with an input which is coupled via connection 21 to the input of device 10 and is provided with a first output which is coupled via a connection 22 to a first input of processing arrangement 3 and is provided with a second output which is coupled via link 27 to the link output of device 10. A first or second control input/output of detection arrangement 4 is coupled via connection 31 or 32, respectively, to the first or second control input/output, respectively, of device 10. A second input of processing arrangement 3 is coupled via link 26 to the link input of device 10 and a control input/output is coupled via control connection 33 to the third control input/output of device 10. An output of processing arrangement 3 is coupled via a connection 24 to an input of switch 9, a first output of which is coupled via connection 25 to the first output of device 10 and a second output of which is coupled via connection 28 to the second output of device 10.

Detection arrangement 4 comprises a first detector 5, an input of which is coupled via connection 21 to the input of detection

arrangement 4 and a control input/output of which is coupled via connection 31 to the first control input/output of detection arrangement 4, and comprises a second detector 7 which functions as a further detection arrangement and an input of which is coupled via connection 21 to the input of detection arrangement 4 and a control input/output of which is coupled via connection 32 to the second control input/output of detection arrangement 4. Detection arrangement 4, furthermore, comprises a first changeover switch 6 which is controlled by first detector 5 and functions as a through-coupling arrangement and a main contact of which is coupled via connection 21 to the input of detection arrangement 4 and a first switch contact of which is coupled via connection 22 to the first output of detection arrangement 4 and a second switch contact of which is coupled via a connection 23 to a main contact of a second changeover switch 8 which is controlled by second detector 7 and functions as a further through-coupling arrangement and a first switch contact of which is coupled via connection 22 to the first switch contact of first changeover switch 6 and to the first output of detection arrangement 4 and a second switch contact of which is coupled via link 27 to the second output of detection arrangement 4.

The operation of the ground station 1 according to the invention which is shown in Figure 1 and comprises the device 10 according to the invention and which is for use in a ground-station system according to the invention, which ground-station system is provided with at least the ground station 1 and the other ground station not shown in Figure 1, is as follows. In this connection, it is assumed that ground station 1 can communicate with a first, a second and a third satellite and that the other ground station can communicate with the third and a fourth satellite, satellite signals to be transmitted via the first, second, third or fourth satellite being referred to as first, second, third or fourth satellite signals, respectively.

A first user who is situated with his mobile station within the range of the first satellite generates, for example, a first satellite signal comprising an identification code of a first type and a destination code. Said first satellite signal is passed to ground station 1, which forms the property of a first operator, by the first satellite, after any necessary conversion. Said first satellite signal is fed via aerial 2 to transceiver 11 which feeds it via connection 20

to demodulator 12, transceiver 11 informing processor 13 via control connection 35 and demodulator 12 informing processor 13 via control connection 30 of the arrival of the first satellite signal. Via connection 21, the demodulated first satellite signal is fed from demodulator to the first detector 5 which is situated in detection arrangement 4 and which detects the identification code of the first type, and to the second detector 7 which is situated in detection arrangement 4 and which detects the destination code. Via control connection 31, first detector 5 informs processor 13 of the identification code of the first type, and via control connection 32, second detector 7 informs processor 13 of the destination code. In response to the detection of the identification code of the first type, first detector 5 controls changeover switch 6 in such a way that the main contact is connected through to the first switch contact, as a consequence of which connection 21 is connected through to connection 22 and the position of the changeover switch 8 controlled by second detector 7 in response to the detected destination code becomes of subordinate importance. Via connection 22, the first satellite signal flows to processing arrangement 3 which processes the first satellite signal, such as, for example, a message-switched satellite signal. Via control connection 33, processing arrangement 3 informs processor 13 of this. The processed first satellite signal is then fed via connection 24 to switch 9 which either detects the destination code yet again or is informed about said destination code via detector 7 and/or processor 13 and, in response thereto, either feeds the processed first satellite signal via connection 25 to the terrestrial network for feeding to another user characterized by the destination code or feeds the processed first satellite signal via connection 28 to modulator 14. Via control connection 35 modulator 14 informs processor 13 of this, after which the modulated first satellite signal is fed via connection 29 to transceiver 11, which informs processor 13 of this via control connection 35 and transmits the modulated first satellite signal via aerial 2 to the first, second or third satellite for feeding to another user characterized by the destination code. Because the first user generates the first satellite signal comprising the identification code of the first type, from which identification code of the first type it is evident that said first user is a subscriber of the first operator, said first satellite

signal is processed in ground station 1, only after which does feeding to the other user take place. The identification code of the first type is, for example, a ground-station identification code of the first type, or operator code of the first type, or is, for example, a mobile-station identification code of the first type, or an MESID (mobile earth station identification code) of the first type.

A second user who is situated with his mobile station within the range of the first satellite generates, for example, a first satellite signal comprising an identification code of a second type and a destination code of a second type. Said first satellite signal is passed by the first satellite, after any necessary conversion, to ground station 1, which forms the property of the first operator. Via aerial 2, said first satellite signal is fed to transceiver 11, which feeds it via connection 20 to demodulator 12, transceiver 11 informing processor 13 via control connection 35 and demodulator 12 informing processor 13 via control connection 30 of the arrival of the first satellite signal. Via connection 21, the demodulated first satellite signal is fed from demodulator to the first detector 5 which is situated in detection arrangement 4 and which detects the identification code of the second type, and to the second detector 7 which is situated in detection arrangement 4 and which detects the destination code of the second type. Via control connection 31, first detector 5 informs processor 13 of the identification code of the second type, and via control connection 32, second detector 7 informs processor 13 of the destination code of the second type. In response to the detection of the identification code of the second type, first detector 5 sets changeover switch 6 in such a way that the main contact is connected through to the second switch contact, as a result of which connection 21 is connected through to connection 23. In response to the detection of the destination code of the second type, second detector 7 sets changeover switch 8 in such a way that the main contact is connected through to the second switch contact, as a result of which connection 23 is connected through to link 27. Via link 27, the first satellite signal, such as, for example, a message-switched satellite signal, flows in the unprocessed state to the other ground station, which forms the property of a second operator, where the first satellite signal is then processed on site in order to feed it to another user characterized by the destination code of the second

type. Because the second user generates the first satellite signal comprising the identification code of the second type, from which identification code of the second type it is evident that said second user is a subscriber of the second operator, said first satellite signal is not processed in ground station 1 but is transmitted in the unprocessed state to the other ground station in order to be processed there on site, only after which does feeding to the other user take place. The identification code of the second type is, for example, a ground-station identification code of the second type, or operator code of the second type, or is, for example, a mobile-station identification code of the second type, or an MESID (mobile earth station identification code) of the second type.

A third user who is situated with his mobile station within the range of the first satellite generates, for example, a first satellite signal comprising an identification code of a second type and a destination code of a first type. Said first satellite signal is passed by the first satellite, after any necessary conversion, to ground station 1, which forms the property of the first operator. Via aerial 2, said first satellite signal is fed to transceiver 11, which feeds it via connection 20 to demodulator 12, transceiver 11 informing processor 13 via control connection 35 and demodulator 12 informing processor 13 via control connection 30 of the arrival of the first satellite signal. Via connection 21, the demodulated first satellite signal is fed from demodulator to the first detector 5 which is situated in detection arrangement 4 and which detects the identification code of the second type and to the second detector 7 which is situated in detection arrangement 4 and which detects the destination code of the first type. Via control connection 31, first detector 5 informs processor 13 of the identification code of the second type, and via control connection 32, second detector 7 informs processor 13 of the destination code of the first type. In response to the detection of the identification code of the second type, first detector 5 sets changeover switch 6 in such a way that the main contact is connected through to the second switch contact, as a result of which connection 21 is connected through to connection 23. In response to the detection of the destination code of the first type, second detector 7 sets changeover switch 8 in such a way that the main contact is connected through to the first switch contact, as a result

of which connection 23 is connected through to connection 22. Via connection 22, the first satellite signal flows to processing arrangement 3, which processes the first satellite signal, such as, for example, a message-switched satellite signal. Via control connection 33 processing arrangement 3 informs processor 13 of this. The processed first satellite signal is then fed via connection 24 to switch 9, which either detects the destination code of the first type yet again or is informed via second detector 7 and/or processor 13 of said destination code of the first type and, in response thereto, feeds the processed first satellite signal to modulator 14, for example, via connection 28. Via control connection 35, modulator 14 informs processor 13 of this, after which the modulated first satellite signal is fed via connection 29 to transceiver 11, which informs processor 13 of this via control connection 35 and which transmits the modulated first satellite signal via aerial 2 to the first, second or third satellite for feeding to another user characterized by the destination code of the first type. While the third user generates the first satellite signal comprising the identification code of the second type, from which identification code of the second type it is evident that said third user is a subscriber of the second operator, said first satellite signal is not actually transmitted in the unprocessed state to the other ground station in order to be processed there on site, but the first satellite signal comprising the identification code of the second type is actually processed in ground station 1, after which feeding to the other user takes place, because the destination code is of the first type, which indicates that the other user is situated, for example, within the range of the first or the second satellite.

If the identification code is a ground-station identification code or operator code, first detector 5 can use said identification code directly to set changeover switch 6. If the identification code is, on the other hand, a mobile-station identification code, or an MESID (mobile earth station identification code), a first table should generally be referred to, of which first table a first portion is regularly updated, for example, via a network-coordinating station (NCS) and of which first table a second portion can be loaded with the required information, for example, by an operator or a user of a mobile station. Such first tables have, for example, a left-hand

column (for example, the first portion) containing mobile-station identification codes and a right-hand column (for example, the second portion) containing corresponding ground-station identification codes or operator codes. Such a first table may be situated in the ground station itself as a so-called internal table (for example, as a component of processor 13 in Figure 1) or be situated in the NCS (network-coordinating station) as a so-called external table, in which case continuous communication does have to take place between the ground station and the NCS. If a user of a mobile station obtains access to the system, for example, via a first or second predetermined number, a first or second ground-station identification code or operator code, respectively, could be set by the system automatically in response thereto. A user of a mobile station can then also set a ground-station identification code or operator code he desires himself, for example, via a predetermined number and a unique code and pin code.

The destination code is, for example, a specific identification of the other user, such as, in a first case, the telephone number of the fixed terminal of the other user or, in a second case, the number of the mobile station of said other user. A destination code of a first type then implies, in the first case, that the telephone number, or a portion thereof (such as a country code) relates to a fixed terminal which is nearer ground station 1, and, in the second case, it implies that the mobile station of the other user is situated within the range of the first, second or third satellite. A destination code of a second type then implies, in the first case, that the telephone number or a portion thereof (such as a country code) relates to a fixed terminal which is nearer the other ground station, and, in the second case, it implies that the mobile station of the other user is situated within the range of the third or fourth satellite. Because users of mobile stations can move with their mobile station, a second table will in general need to be referred to, which second table has, for example, a left-hand column containing numbers of mobile stations and telephone numbers of fixed terminals and has a right-hand column containing locations. In general, said location is stored automatically. Such a second table may be situated in the ground station itself as a so-called internal table (for example as a component of processor 13 in Figure 1) or it is situated in the NCS

(network-coordinating station) as a so-called external table, in which case continuous communication does have to take place between the ground station and the NCS.

Instead of a table containing two columns (containing, for example, identification codes or destination codes in the left-hand column and, for example, ground-station identification codes or operator codes or locations in the right-hand column) a table having only one column (the left-hand column) could of course be used, in which case it is then necessary to investigate whether, for example, an identification code or a destination code is situated in said one column or not, for example by confirming an equality or inequality, and in which case if it is present (equality) a first operation (for example, selection of a first ground-station identification code or operator code or location) is then subsequently carried out and, if it is absent (inequality), a second operation (for example, selection of a second ground-station identification code or operator code or location) is carried out.

The detection arrangement 4 shown in Figure 1 comprises first detector 5 and the changeover switch 6, which functions as a through-coupling arrangement, and it preferably comprises second detector 7 and the second changeover switch 8, which functions as a further through-coupling arrangement. Of course, the two changeover switches 6 and 8 could also alternatively be seen separately from the detection arrangement 4, in which case detection arrangement 4 comprises only first detector 5 and, preferably, second detector 7.

The transceiver 11 demodulator 12 and modulator 14 shown in Figure 1 will generally have more functions known to the person skilled in the art than those which have hitherto been discussed. Thus, satellite signals arriving via aerial 2 will be time-multiplexed and/or frequency-multiplexed and they then have to be demultiplexed, and signals to be sent via aerial 2 will have to be time-multiplexed and/or frequency-multiplexed. In this connection, identification codes and destination codes can be indicated both by means of, for example, a header and by means of a predetermined, defined location. Furthermore, a portion of the signal content of satellite signals arriving via aerial 2 will be destined for processor 13, and another portion will be destined for device 10, and a portion of a signal content arriving via connection 28 at modulator 14 will generally have

to be combined with another portion of a signal content arriving via control connection 34 at modulator 14.

Given the above, it will be clear that, for each ground station, device 10, transceiver 11, demodulator 12 and modulator 14 will have to be implemented, for example, in duplicate, triplicate, quadruplicate or quintuplicate, and that aerial 2 is implemented as a separate transmitting aerial and receiving aerial. Of course, at least one aerial is always present for each satellite to be reached.

The links shown in Figure 1 as an incoming link 26 and an outgoing link 27 are communication connections which can be formed, for example, by means of copper connections and/or glass-fibre connections and/or satellite connections and/or terrestrial radio connections. If the two respective links 26 and 27 are formed by means of satellite connections, they will generally have to be coupled to at least one of the devices 10 or at least one of the modulators 14, respectively.

In general a ground station comprises software of which at least one part can be split up (symbollically) into for example at least a first program for the reception etc. of signals, a second program for dealing with received signals, a third program for the processing etc. of received signals, a fourth program for dealing with processed signals etc. and a fifth program for dealing with received but unprocessed signals etc. So, according to this example, for a first kind of signals the first, second, third and fourth programs are run, and for a second kind of signals the first, second and fifth programs are run. Although the fourth and fifth programs could be entirely different, it would also be possible that at least a part of these fourth and fifth programs will coincide.

Claims

1. Ground-station system comprising a first ground station (1) which is provided with
- at least one first aerial (2) for the reception of a first satellite signal comprising an identification code,
- a first processing arrangement (3) comprising a first input, coupled to the first aerial (2), for the reception and processing of the first satellite signal and comprising a first output for the generation of a first outgoing signal, and
- a first detection arrangement (4,5) for detecting the identification code,
and comprising a second ground station which is provided with
- at least one second aerial for the reception of a second satellite signal comprising an identification code,
- a second processing arrangement comprising a second input, coupled to the second aerial, for the reception and processing of the second satellite signal and comprising a second output for the generation of a second output signal, and
- a second detection arrangement for detecting the identification code,
characterized in that the first detection arrangement (4,5) is provided with a first through-coupling arrangement (6) for through-coupling the first aerial (2) to the first processing arrangement (3) in response to an identification code of a first type and for through-coupling the first aerial (2) to a further second input of the second processing arrangement via a first link (27) in response to an identification code of a second type.

2. Ground-station system according to Claim 1, characterized in that the first satellite signal comprises a destination code, the first ground station (1) being provided with
- a further first detection arrangement (7) for detecting the destination code,
- a further first through-coupling arrangement (8) for through-coupling the first aerial (2) to the first processing arrangement (3) in response to a destination code of a first type and for through-coupling the first aerial (2) to the further second input of the

second processing arrangement via the first link (27) in response to a destination code of a second type.

3. Ground-station system according to Claim 1 or 2, characterized in that the second detection arrangement is provided with a second through-coupling arrangement for through-coupling the second aerial to the second processing arrangement in response to an identification code of a second type and for through-coupling the second aerial to a further first input of the first processing arrangement via a second link in response to an identification code of a first type.

4. Ground-station system according to Claim 3, characterized in that the second satellite signal comprises a destination code, the second ground station being provided with

- a further second detection arrangement for detecting the destination code,
- a further second through-coupling arrangement for through-coupling the second aerial to the second processing arrangement in response to a destination code of a first type and for through-coupling the second aerial to the further first input of the first processing arrangement via the second link in response to a destination code of a second type.

5. Ground station (1) for use in a ground-station system and provided with

- at least one aerial (2) for the reception of a satellite signal comprising an identification code,
- a processing arrangement (3) comprising an input, coupled to the aerial (2), for the reception and processing of the satellite signal and comprising an output for the generation of a first outgoing signal, and
- a detection arrangement (4,5) for detecting the identification code, characterized in that the detection arrangement (4,5) is provided with a through-coupling arrangement (6) for through-coupling the aerial (2) to the processing arrangement (3) in response to an identification code of a first type and for through-coupling the aerial (2) to a link (27) coupled to a further ground station for feeding at least a portion of the satellite signal to said further

ground station in response to an identification code of a second type.

6. Ground station (1) according to Claim 5, characterized in that the satellite signal comprises a destination code, the ground station (1) being provided with

- a further detection arrangement (7) for detecting the destination code,
- a further through-coupling arrangement (8) for through-coupling the aerial (2) to the processing arrangement (3) in response to a destination code of a first type and for through-coupling the aerial (2) to the link (27) coupled to the further ground station in response to a destination code of a second type.

7. Device (10) for use in a ground station (1) which is provided with an aerial (2) for the reception of a satellite signal comprising an identification code, which device (10) is provided with

- a processing arrangement (3) comprising an input which can be coupled to the aerial (2) for the reception and processing of the satellite signal and comprising an output for the generation of a first outgoing signal, and
- a detection arrangement (4,5) for detecting the identification code, characterized in that the detection arrangement (4,5) is provided with a through-coupling arrangement (6) for through-coupling the aerial (2) to the processing arrangement (3) in response to an identification code of a first type and for through-coupling the aerial (2) to a link (27) coupled to a further ground station for feeding at least a portion of the satellite signal to said further ground station in response to an identification code of a second type.

8. Device (10) according to Claim 7, characterized in that the satellite signal comprises a destination code, the device (10) being provided with

- a further detection arrangement (7) for detecting the destination code, and
- a further through-coupling arrangement (8) for through-coupling the aerial (2) to the processing arrangement (3) in response to a destination code of a first type and for through-coupling the aerial (2) to the link (27) coupled to the further ground station in response

to a destination code of a second type.

9. Method for processing a satellite signal originating from a satellite by a ground station, which method comprises the steps of

- the reception of the satellite signal comprising an identification code via an aerial of the ground station,
- the feeding of the satellite signal to a processing arrangement of the ground station,
- the processing of the satellite signal by the processing arrangement of the ground station and generation of a first outgoing signal, and
- the detection of the identification code by a detection arrangement of the ground station,

characterized in that the method comprises the steps of

- the through-coupling of the aerial of the ground station to the processing arrangement of the ground station in order to process the satellite signal via the processing arrangement of the ground station in response to an identification code of a first type, and
- the through-coupling of the aerial of the ground station to a link coupled to a further ground station for feeding at least a portion of the satellite signal to said further ground station in order to process at least the portion of the satellite signal via a further processing arrangement of the further ground station in response to an identification code of a second type.

10. Method according to Claim 9, characterized in that the method comprises the steps of

- the detection of a destination code associated with the satellite signal by a further detection arrangement of the ground station,
- the through-coupling of the aerial of the ground station to the processing arrangement of the ground station in order to process the satellite signal via the processing arrangement of the ground station in response to a destination code of a first type, and
- the through-coupling of the aerial of the ground station to the link coupled to the further ground station for feeding at least the portion of the satellite signal to said further ground station in order to process at least the portion of the satellite signal via the

further processing arrangement of the further ground station in response to a destination code of a second type.

11. A ground station system substantially as described herein with reference to the drawing.

12. A method of processing a satellite signal originating from a satellite by a ground station substantially as described herein with reference to the drawing.

DATED this TWENTIETH day of NOVEMBER 1997
Koninklijke PTT Nederland N.V.

Patent Attorneys for the Applicant
SPRUSON & FERGUSON

AUSTRALIAN PATENT OFFICE

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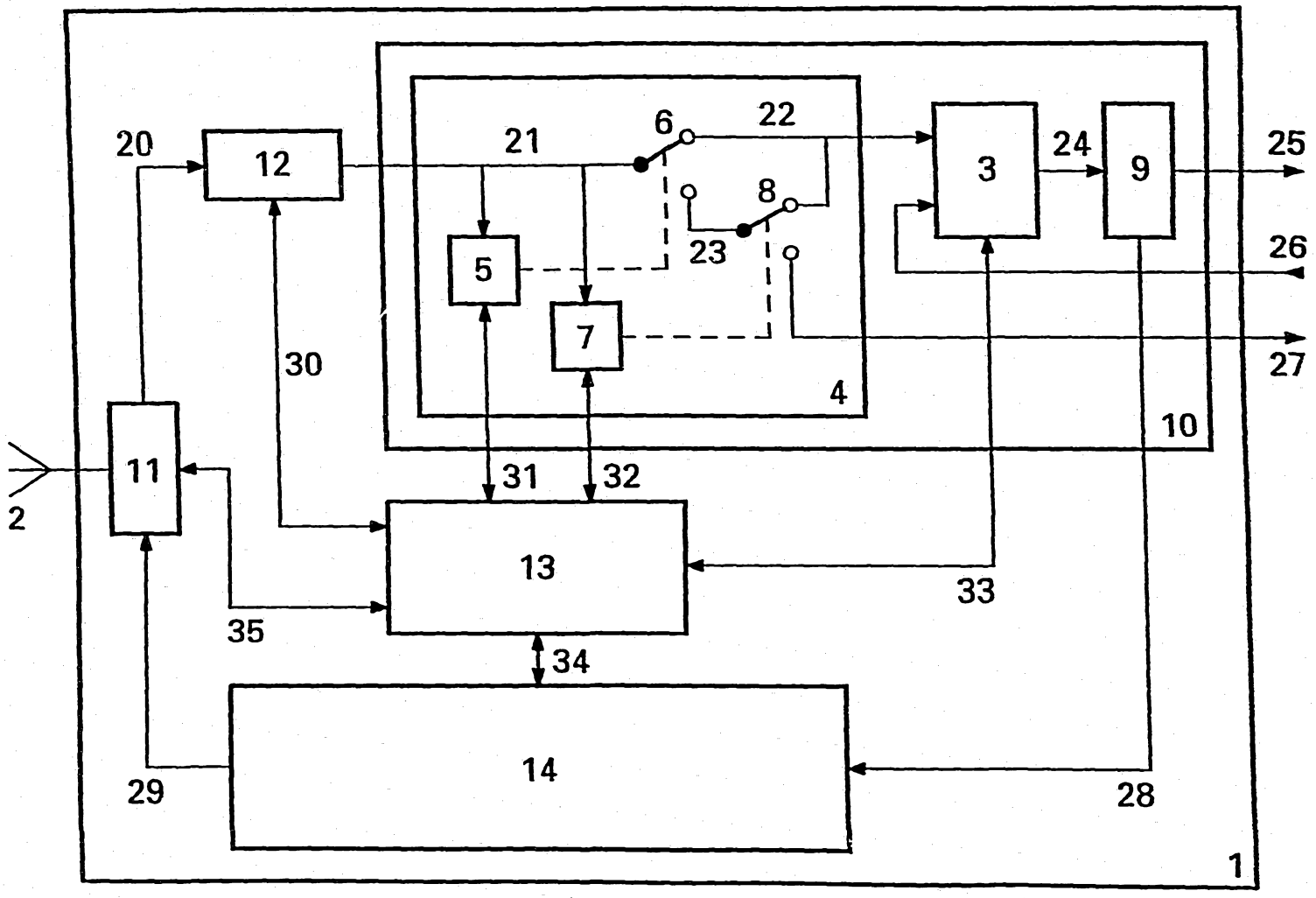

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Fig. 1

INTERNATIONAL SEARCH REPORT

Internatu Application No
PCT/EP 96/02534

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04B7/185

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)
IPC 6 H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO,A,92 19050 (MOTOROLA) 29 October 1992 see page 18, line 8 - page 19, line 18; figure 8B	1-10
A	WO,A,92 00636 (PACTEL CORPORATION) 9 January 1992 see page 2, line 17 - page 3, line 11; figures 1-6	1-10
A	GB,A,2 275 588 (KOKUSAI DENSHIN DENWA KABUSHIKI KAISHA) 31 August 1994 see claims 1-8; figures 1-8	1-10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"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
20 September 1996	- 8. 10. 96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Bischof, J-L

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INTERNATIONAL SEARCH REPORT

Internat l Application No
PCT/EP 96/02534

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