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(54) Ensuring an uninterrupted reception of an IP transmission in a mobile reception

Sicherstellung eines ununterbrochenen Empfangs einer IP-Übertragung in einem Mobilempfang

Procédé et système permettant d'assurer de la réception ininterrompue d'une transmission IP dans une réception mobile

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Description

FIELD OF THE INVENTION

[0001] The invention relates to telecommunications, in particular to the uninterrupted reception of an IP transmission with a mobile terminal device. In particular, the invention relates to the uninterrupted reception of an IP broadcast.

BACKGROUND OF THE INVENTION

[0002] As digital broadcasts are becoming common, several different solutions have been developed for the wireless reception. The simplest solution is the traditional re-tuning, which is used in analogous systems, too. When e.g. a car radio moves out of the range of a certain transmitter, it is re-tuned, which enables one to proceed with the listening. It is also possible to arrange in the radio a separate automatic tuning system. In that case, however, there is an interruption in conjunction with the channel change. In a digital system, the interruption result in bigger disadvantages because the data stream to be transmitted is often packed in such a manner that the packing of the data to be repeated depends on the previous data. In case there is no previous data, the data packet cannot be unloaded but one has to wait for a data packet not depending on the previous data packet.

[0003] In broadcasts it is possible to use also OFDM modulation (Orthogonal Frequency-division multiplexing) in a single-frequency network. By using single-frequency networks it is possible to build wide-ranging networks and to ensure an uninterrupted reception of services throughout the whole network. Generally, however, there is a wish to avoid the same service to be transmitted in networks which use several transmitters operating at different frequencies or several single-frequency networks operating at different frequencies. In this application, reference is not made to single-frequency networks specifically, since from the standpoint of the invention it is not important whether the service is transmitted at the same frequency using one or more transmitters.

[0004] The solutions of an uninterrupted reception in accordance with the prior art require a complicated receiver as well as a transmission network that meets certain requirements. Systems of this kind include e.g. DVB (Digital Video Broadcasting) and DAB systems (Digital Audio Broadcasting) which use the OFDM modulation. Also other corresponding systems exist. In DVB and DAB systems, the information is transmitted by means of symbols. The duration of a symbol varies from a couple of hundreds of micro seconds to a little more than one millisecond. In the DVB system, one symbol may contain data from all services coming along with the same signal. In that case, stopping to receive the signal for a moment and tuning the receiver to another frequency results in an interruption in the reception. Interruptions cannot naturally be accepted. In the DAB system, one symbol typ-

ically contains data from one or two services at the most. Due to this, short interruptions are possible in the DAB system. This, however, requires that the receiver can be quickly tuned to another frequency. If a transmission to be transmitted at another frequency contained different services, a change in the DAB standard would be necessary in order to be able, by means of the DAB definition, to create a system that enables one to transmit several services in such a manner that the change over to another frequency does not result in interruptions.

[0005] As network techniques are combined, more and more services are transmitted on IP basis. Also image and voice can be transmitted on IP basis. Due to this, most telecommunications networks are nowadays built in such a manner that they are capable of transmitting also continuous IP telecommunication stream. This is often called IP encapsulation or tunnelling. The interruptions in the IP traffic caused by the change from one frequency to another can be corrected by means of a specific error correction or buffers. In case one moves over to another frequency very quickly, the portion of the payload from the total load is big, and error correction is a functional solution. Generally, however, there is no guarantee about the fact that the delays and errors caused by the change of frequency would be small. In case the receiver has a return channel at its disposal, the missing or defective packets can be requested once again. This takes time and consumes the limited telecommunication capacity shared with the other terminal devices. In addition, it is not possible to arrange a return channel in every terminal device.

[0006] Prior art includes EP 1073224 A2 which discloses a radio transmission signal consisting of signal frames that comprise a dynamic data part and a quasi-static data part as well as a method to perform a seamless switching of a receiver for such radio transmission signals from a first currently tuned frequency to a second alternative frequency. The dynamic data part of a respective frame contains an indicator showing in which following frame the quasi-static data part of this respective frame will be repeated.

OBJECTIVE OF THE INVENTION

[0007] The objective of the invention is to eliminate the drawbacks referred to above or at least to significantly alleviate them. One specific objective of the invention is to disclose a new type of method and system for the uninterrupted reception of an IP based broadcast with a mobile terminal device.

BACKGROUND OF THE INVENTION

[0008] The present invention relates to the uninterrupted reception of an IP based broadcast with a mobile terminal device. Characteristic of the method in accordance with the invention is to give the receiver enough time to get tuned to a new frequency. Time is needed for finding

out the quality of the receiver's transmission as well as for changing over to a second receiver, in case the quality of the second receiver is better than that of the first one. The IP packets to be sent are arranged in such a manner that they are consecutive in respect of time, and enough time is left in between them for tuning. The advantage of the solution of IP level as compared to prior art is in that the various existing IP services are built in such a manner that they function, although the packets would not flow evenly throughout the network. This is due to the fact that various random delays typically occur in IP networks. Due to this, the adding of delays at this layer is natural, and the functionality of the services can be ensured without complicated timing systems.

[0009] The present invention enables one to build such a system in which it is possible to ensure the uninterrupted reception of an IP packet stream in a mobile terminal device with no return channel. Furthermore, the invention enables one to perform smooth changes both from one frequency to another inside the transmission system and between two different transmission systems.

LIST OF FIGURES

[0010] In the following section, the invention is described in detail with reference to the examples of its embodiments, wherein

Fig. 1 represents the placing of the data packets according to the method in accordance with the invention,

Fig. 2 represents the division of IP packets into frames according to the method in accordance with the invention,

Fig. 3 represents a transmitter in accordance with the invention,

Fig. 4 represents a receiver in accordance with the invention,

Fig. 5 represents a method of division into frames of services according to the invention, and

Fig. 6 represents the optimisation method of frames according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0011] Fig. 1 represents the functioning of the method in accordance with the invention. For applying the method as shown in Fig. 1, a system is utilised that comprises two transmitters and a receiver. There may be even several transmitters. In Fig. 1, the stream transmitted by the first transmitter is shown at point 10, and the stream transmitted by the second transmitter is shown at point 11. In transmission streams 10 and 11, the desired service is transmitted. There is a pause between the service packets. The receiver receives the chosen stream 12, which in the example of the figure is one or the other of the transmission streams 10 or 11. During the pauses in the transmission it can be checked whether the signal of the

second transmitter is better. There are two possibilities of acting during the pause. In both cases (points 13 and 14), the receiver is tuned to a new frequency as the pause starts, and the quality of the signal occurring at this frequency is measured. In case the original transmission is better than the new one, the procedure in accordance with point 13 is used, according to which the receiver is tuned to the original frequency after the measurement. In case the original signal is of lower quality than the measured new signal, one acts as shown at point 14. Point 14 corresponds to point 13 in every respect except for the fact that after the measurement, the receiver is no longer tuned but the tuning of the measured station is left in force.

[0012] Fig. 2 represents making the pauses as shown in Fig. 1 in a real IP transmission. The services to be transmitted have been evenly divided into a data stream at step IP1. The packets may flow irregularly because there are different random delays in different services. Fig. 2 shows an application transmitting four different services, wherein the packet symbols P1, P2, P3 and P4 correspond to the service. The services are divided into two different transmission frames A and B. In the example, the packets of services P1 and P2 have been placed in frame A, and the packets of services P3 and P4 have been placed in frame B. There may be even more frames and services as long as the frame used by the service is not changed in the middle of the transmission. In the example two frames are used that are transmitted by turns. In that case, frame B functions as a pause for frame A as shown in Fig. 1 and vice versa. As the pauses have been arranged in this manner, making pauses does not lead to the decreasing of the payload to be transmitted, instead it is a question about rhythmising the transmission, in which the capacity of the transmission path can be made use of all the time. At the beginning of each frame, a separate signalling packet is placed that contains information on the services to be transmitted in the frame. It is also possible to place in the signalling packet information on alternative frequencies or transmitter parameters.

[0013] Fig. 3 represents a transmission system according to the invention. The data sources 30, 31 and 32 shown in the figure are servers or other data sources. The content of the data sources has been arranged in such a manner that services which one wishes to receive simultaneously using the same terminal device have been arranged in the same data source. The number of terminal devices has not been limited, instead their number can be varied when necessary. In an alternative implementation, it is possible to arrange in the services information on the connection between them, and no separate data sources are needed. This can be implemented e.g. by arranging virtual services in one big server device.

[0014] The system in accordance with the invention places the piece of information of each data source in a frame type of their own according to the method as shown in Fig. 2. The frames are arranged in the encoding unit

MIPE. The encoding unit MIPE may add to the frames also control data or some other information to be used in the reception. After the preparation of the frames, the encoding unit directs the packets to the appropriate relay station through the information network 37. In the embodiment of the example there are the transmitting stations 34, 35 and 36 that function at frequencies of their own. The information network 37 can be any telecommunications network which enables one to ensure a sufficient quality of the service. A sufficient quality of the service can be ensured typically in a network in which the data transfer delays are small or standard ones. Further, the order of the transmitted packets must remain the same. The encoding unit MIPE is responsible for checking that the services to be transmitted are sent according to the limitations, and that there is e.g. no attempt to exceed the maximum transfer rate. To ensure this, the encoding unit MIPE must be aware of the maximum allowed rate throughout the whole transmission path.

[0015] The transmitting stations 34, 35 and 36 are typically transmitting stations in service. In the example of the embodiment, the relay station consists of four components. The first part is an IP encapsulator 33 which receives IP packet traffic from the information network 37 and converts the frames into the frame form used by the transmission system. As a second component, it is possible to use a multiplexer MUX which enables one to include in the same transmission stream services that are not transmitted on IP basis. These typically include radio and TV broadcasts. The multiplexer MUX is not an obligatory component. As a third component there is a modulator MOD which modulates the signal to be transmitted, which signal is amplified by a fourth component, which is an output stage PA. The amplified and modulated signal is transmitted to a transmission antenna (not shown).

[0016] Fig. 4 represents a receiver in accordance with the invention. The receiver includes a tuner 40, a demodulator 41, a demultiplexer 42, an IP decoder 43, as well as control units 44 and 45. The control units can also be combined. The use of two units enables one to add functionality to such devices that are otherwise capable of reception except for the fact that the logic required for applying the method in accordance with the invention lacks. Devices of this kind include e.g. computers. The purpose of the control units is to arrange the tuning, measuring and re-tuning during a pause in the transmission. When the control unit detects a pause after a frame, it gives the tuning unit 40 a command to get tuned to a new frequency, whose quality is measured. In case the quality is better than the previous one, the tuning remains in use. In case the quality is lower, the tuning unit 40 gets tuned back to the previous frequency. After this it is possible to receive the next packet. Typically, the receiver maintains a mean value of the measuring results of different channels and tries to always receive the best possible station. The changing from one transmission system to another is performed in the same manner as the

changing of the frequency inside a transmission system in accordance with one technology.

[0017] Fig. 5 represents a sectioning algorithm to be used in the arrangement of frames as shown in Figs. 2 and 3. The sectioning algorithm is performed in the encoding unit MIPE and in the transmitting data source 30, 31 or 32. The data source asks the encoding unit for a permission to send continuous data stream at a certain rate via certain relay stations, step 50. The encoding unit checks whether there is room in frame A at all the desired relay stations. If there is no room in frame A, frame B is checked next, step 51. If there are more frames, they are all gone through, until a frame which has enough capacity has been found. If there is enough capacity for the broadcast, permission to transmit is granted, step 54. If there is no such frame, the encoding unit sends the data source a request to wait and tries to arrange a sufficient capacity by transferring previous services between the frames, step 52. After this, the adequacy of the capacity is checked, step 53. In case the arrangement has brought enough capacity, permission to transmit is granted, step 54. If the re-arrangement does not lead to any results, the encoding unit does not give the data source permission to transmit, step 55.

[0018] Fig. 6 represents one arranging algorithm to be used in a system in accordance with the invention. The re-arrangement of the transmissions can be implemented e.g. by going through all the possible combinations, step 60. The encoding unit places the transmissions of every data source either in source A or B, and the capacity is compared to the need for capacity of the combinations, step 61. Such alternatives are rejected in which the capacity of some relay station, as one or the other of the groups is concerned, is exceeded, step 62. From the remaining alternatives the one is chosen in which the free capacity of frame B of all combined stations is as big as possible, step 62. The invention is not limited merely to the examples of its embodiments referred to above, instead various modifications are possible within the scope of the inventive idea defined by the claims.

Claims

1. A method for ensuring an uninterrupted reception of an IP transmission comprising one or more services, the method comprising the steps of:

sending IP transmission with one or more transmitters;
receiving IP transmission with a terminal device;
monitoring alternative transmission frequencies; and
tuning the terminal device to a new frequency when detecting a pause in the received IP transmission;

characterised in that the IP transmission is sectioned at least into two frames so that data

packets relating to the same service are always transmitted in the same frame, wherein one of the at least two frames functions as the pause in the transmission for the other frame.

2. The method according to claim 1, **characterised in that** the aforementioned frames are transmitted so that the aforementioned second frame functions as a pause for the aforementioned first frame.

3. The method according to claim 1 or 2, **characterised in that** the terminal device is tuned to a new frequency during the aforementioned pause, and the quality of the transmission appearing at the new frequency is measured.

4. The method according to claim 3, **characterised in that** the terminal device is tuned back to a previous frequency, in case the measured new frequency is weaker than the previous one.

5. The method according to claim 1 or 2, **characterised in that** the encoding unit is used to arrange the services to be transmitted into said frames.

6. The method according to claim 1, 2 or 5, **characterised in that** the space available in the frames is optimised by re-arranging the services to be transmitted between the frames, in case the service to be transmitted needs more space than the space available in separate frames.

7. The method according to any one of claims 1-6, **characterised in that** at the beginning of the frame, a piece of signalling information is placed that comprises the information on the frame's content.

8. The method according to claim 7, **characterised in that** the piece of signalling information comprises a piece of information on the durations of the pause of the services included in the frame.

9. The method according to any one of claims 1-8, **characterised in that** the frames are transmitted in a predetermined order.

10. A transmission system for ensuring an uninterrupted reception of an IP transmission comprising one or more services, the system comprising:

at least one data source (30, 31 and 32) for providing a service;
at least one transmitting station (34, 35 and 36) for sending the service to a terminal device; and
an information network (37) for connecting the data sources and the transmitting stations;
characterised in that the system further comprises:

an encoding unit (MIPE) for encoding the service to be transmitted from the data sources (30, 31 and 32) and for sectioning into at least two frames prior to sending to the information network (37) so that data packets relating to the same service are always transmitted in the same frame, wherein one of the at least two frames functions as a pause in the transmission for the other frame.

11. The system according to claim 10, **characterised in that** the encoding unit (MIPE) is arranged to section the frames so that the second frame functions as a pause to the first frame.

12. The system according to claim 10 or 11, **characterised in that** the encoding unit (MIPE) is arranged to place the services to be transmitted in the frames such that the space available in the second frame is maximized.

13. The system according to claim 10, **characterised in that** the data source (30, 31 or 32) is arranged to send a request for service transmission to the encoding unit (MIPE).

14. The system according to claim 12 or 13, **characterised in that** the encoding unit (MIPE) optimises the frames in such a case when the data source (30, 31 or 32) sends a request for service transmission and the space required by the requested service is bigger than the space available in the frames as currently sectioned.

15. The system according to claim 14, **characterised in that** the encoding unit (MIPE) is arranged to transmit a cancellation message to the data source (30, 31 or 32) in response to the request for service transmission, in case the additional space brought about by the optimising of the frames is smaller than the space needed for the transmission of the requested service.

16. A terminal device for receiving an uninterrupted IP transmission, **characterised in that** the terminal device comprises a receiver (40-45) for receiving a transmission sectioned into frames, which frames have been sectioned at least into two frames so that data packets relating to the same service are always received in the same frame, wherein one of the at least two frames functions as a pause in the transmission for the other frame.

17. The terminal device according to claim 16, **characterised in that** the terminal device is arranged to tune and measure a new frequency during the pause in the transmission.

18. The terminal device according to claim 16 or 17, **characterised in that** the terminal device is arranged to re-tune the old frequency, in case the new measured frequency is of lower quality than the old frequency.

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Patentansprüche

1. Verfahren zur Sicherstellung eines ununterbrochenen Empfangs einer IP-Übertragung, die einen oder mehrere Dienste aufweist, welches Verfahren die Schritte aufweist:

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Senden einer IP-Übertragung mit einem oder mehreren Sendern;
Empfangen der IP-Übertragung mit einer Endgerätevorrichtung;
Überwachen alternativer Übertragungsfrequenzen; und
Einstellen der Endgerätevorrichtung auf eine neue Frequenz, wenn eine Pause in der empfangenen IP-Übertragung erfasst wird;
dadurch gekennzeichnet, dass die IP-Übertragung in zumindest zwei Rahmen unterteilt wird, so dass Datenpakete, die sich auf denselben Dienst beziehen, immer in demselben Rahmen übertragen werden, wobei einer der zumindest zwei Rahmen als die Pause in der Übertragung für den anderen Rahmen dient.

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2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die vorgenannten Rahmen so übertragen werden, dass der vorgenannte zweite Rahmen als eine Pause für den vorgenannten ersten Rahmen dient.

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3. Verfahren nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Endgerätestevorrichtung während der vorgenannten Pause auf eine neue Frequenz eingestellt und die bei der neuen Frequenz erscheinende Qualität der Übertragung gemessen wird.

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4. Verfahren nach Anspruch 3, **dadurch gekennzeichnet, dass** die Endgerätevorrichtung zurück auf eine vorhergehende Frequenz eingestellt wird für den Fall, dass die gemessene neue Frequenz schwächer als die vorhergehende ist.

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5. Verfahren nach Anspruch 1 oder 2, **dadurch, gekennzeichnet, dass** die Codiereinheit zum Anordnen der zu, übertragenden Dienste in den Rahmen verwendet wird.

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6. Verfahren nach Anspruch 1, 2 oder 5, **dadurch gekennzeichnet, dass** der in den Rah-

men verfügbare Raum optimiert wird durch Neuordnung der zu übertragenden Dienste zwischen den Rahmen für den Fall, dass der zu übertragende Dienst mehr Raum als den in getrennten Rahmen verfügbaren Raum benötigt.

7. Verfahren nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** am Anfang des Rahmens ein Stück zum Signalisieren von Informationen angeordnet wird, das die Informationen über den Inhalt des Rahmens aufweist.

8. Verfahren nach Anspruch 7, **dadurch**

gekennzeichnet, dass das Stück zum Signalisieren von Informationen ein Stück von Informationen über die Dauern der Pause der in dem Rahmen enthaltenen Dienste aufweist.

9. Verfahren nach einem, der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** die Rahmen in einer vorbestimmten Reihenfolge übertragen werden.

10. Übertragungssystem zum Sicherstellen eines ununterbrochenen Empfangs einer IP-Übertragung, die eine oder mehrere Dienste aufweist, welches System aufweist:

zumindest eine Datenquelle (30, 31 und 32) zum Vorsehen eines Dienstes;
zumindest eine Sendestation (34, 35 und 36) zum Senden des Dienstes zu einer Endgerätevorrichtung; und
ein Informationsnetzwerk (37) zum Verbinden der Datenquellen und der Sendestationen;
dadurch gekennzeichnet, dass das System weiterhin aufweist:

eine Codiereinheit (MIPE) zum Codieren des von den Datenquellen (30, 31. und 32) zu übertragenden Dienstes und zum Unterteilen in zumindest zwei Rahmen vor dem Senden zu dem Informationsnetzwerk (37), so dass Datenpakete, die sich auf denselben Dienst beziehen, immer in demselben Rahmen übertragen werden, wobei einer der zumindest zwei Rahmen als eine Pause bei der Übertragung für den anderen Rahmen dient.

11. System nach Anspruch 10, **dadurch gekennzeichnet, dass** die Codiereinheit (MIPE) zum Unterteilen der Rahmen so ausgebildet ist, dass der zweite Rahmen als eine Pause für den ersten Rahmen dient.

12. System nach Anspruch 10 oder 11, **dadurch ge-**

kennzeichnet, dass die Codiereinheit (PIPE) zum Anordnen der zu übertragenden Dienste in den Rahmen so ausgebildet ist, dass der in dem zweiten Rahmen verfügbare Raum maximiert wird.

13. System nach Anspruch 10, **dadurch gekennzeichnet, dass** die Datenquelle (30, 31 oder 32) zum Senden einer Anforderung für eine Dienstübertragung zu der Codiereinheit (MIPE) ausgebildet ist.
14. System nach Anspruch 12 oder 13, **dadurch gekennzeichnet, dass** die Codiereinheit (MIPE) die Rahmen in einem derartigen Fall optimiert, in welchem die Datenquelle (30, 31 oder 32) eine Anforderung für eine Dienstübertragung sendet und der durch den angeforderten Dienst benötigte Raum größer als der Raum ist, der in den Rahmen wie gewöhnlich unterteilt verfügbar ist.
15. System nach Anspruch 14, **dadurch gekennzeichnet, dass** die Codiereinheit (MIPE) zum Übertragen einer Löschungsnachricht zu der Datenquelle (30, 31 oder 32) als Antwort auf die Anforderung einer Dienstübertragung für den Fall ausgebildet ist, dass der zusätzliche Raum, der durch die Optimierung der Rahmen erhalten wird, kleiner ist als der Raum, der für die Übertragung des angeforderten Dienstes benötigt wird.
16. Endgerätevorrichtung zum Empfangen einer ununterbrochenen IP-Übertragung, **dadurch gekennzeichnet, dass** die Endgerätevorrichtung einen Empfänger (40 - 45) zum Empfangen einer in Rahmen unterteilten Übertragung aufweist, welche Rahmen in zumindest zwei Rahmen so unterteilt wurden, dass Datenpakete, die sich auf denselben Dienst beziehen, immer in demselben Rahmen empfangen werden, wobei einer der zumindest zwei Rahmen als eine Pause in der Übertragung für den anderen Rahmen dient.
17. Endgerätevorrichtung nach Anspruch 16, **dadurch gekennzeichnet, dass** die Endgerätevorrichtung ausgebildet ist zum Einstellen und Messen einer neuen Frequenz während der Pause in der Übertragung,
18. Endgerätevorrichtung nach Anspruch 16 oder 17, **dadurch gekennzeichnet, dass** die Endgerätevorrichtung ausgebildet ist zum Wiedereinstellen der alten Frequenz für den Fall, dass die neue gemessene Frequenz eine geringere Qualität als die alte Frequenz hat.

Revendications

1. Procédé permettant d'assurer une réception ininter-

rompue d'une transmission IP comprenant un ou plusieurs services, le procédé comprenant les étapes consistant à :

- 5 envoyer une transmission IP avec un ou plusieurs émetteur recevoir la transmission IP avec un dispositif terminal ;
- surveiller des fréquences de transmission alternatives ; et
- 10 syntoniser le dispositif terminal à une nouvelle fréquence, lors de la détection d'une pause dans la transmission IP reçue ;
- caractérisé en ce que** la transmission IP est fragmentée en au moins deux trames, de manière que des paquets de données afférents au même service soit toujours transmis dans la même trame, dans lequel l'une des au moins deux trames sert de pause dans la transmission pour l'autre trame.
2. Procédé selon la revendication 1, **caractérisé en ce que** les trames mentionnées ci-dessus sont transmises de manière que la deuxième trame mentionnée ci-dessus serve de pause pour la première trame mentionnée ci-dessus.
3. Procédé selon la revendication 1 ou 2, **caractérisé en ce que** le dispositif terminal est syntonisé à une nouvelle fréquence durant la pause mentionnée ci-dessus, et la qualité de la transmission apparaissant à la nouvelle fréquence est mesurée.
4. Procédé selon la revendication 3, **caractérisé en ce que** le dispositif terminal est resyntonisé à une fréquence antérieure, dans le cas où la nouvelle fréquence mesurée est plus faible que l'antérieure.
5. Procédé selon la revendication 1 ou 2, **caractérisé en ce que** l'unité de codage est utilisée pour agencer les services pour qu'ils soient transmis dans lesdites trames.
6. Procédé selon la revendication 1, 2 ou 5, **caractérisé en ce que** l'espace disponible dans les trames est optimisé par réagencement de services à transmettre entre les trames, dans le cas où le service à transmettre demande plus d'espace que l'espace disponible dans des trames séparées.
7. Procédé selon l'une quelconque des revendications 1 à 6, **caractérisé en ce que**, au début de la trame, est placé un élément d'information de signalisation comprenant l'information au sujet du contenu de la trame.
8. Procédé selon la revendication 7, **caractérisé en ce que** l'élément d'information de signalisation comprend un élément d'information au sujet des durées

de pause des services inclus dans la trame.

9. Procédé selon l'une quelconque des revendications 1 à 8, **caractérisé en ce que** les trames sont transmises dans un ordre déterminé.

10. Système de transmission, permettant d'assurer une réception ininterrompue d'une transmission IP comprenant un ou plusieurs services, le système comprenant :

au moins une source de données (30, 31 et 32) pour fournir un service ;
au moins une station de transmission (34, 35 et 36), pour envoyer le service à un dispositif terminal ; et
un réseau d'information (37) pour connecter les sources de données et les stations de transmission ;
caractérisé en ce que le système comprend en outre :

une unité de codage (MIPE) pour coder le service à transmettre à partir des sources de données (30, 31 et 32) et pour fragmenter en au moins deux trames, avant d'envoyer au réseau d'information (37), de manière que des paquets de données concernant le même service soient toujours transmis dans la même trame, dans lequel l'une des au moins deux trames sert de pause dans la transmission pour l'autre trame.

11. Système selon la revendication 10, **caractérisé en ce que** l'unité de codage (MIPE) est agencée pour fragmenter les trames, de manière que la deuxième trame serve de pause pour la première trame.

12. Système selon la revendication 10 ou 11, **caractérisé en ce que** l'unité de codage (MIPE) est agencée pour placer les services à transmettre dans les trames, de manière que l'espace disponible dans la deuxième trame soit rendu maximal.

13. Système selon la revendication 10, **caractérisé en ce que** la source de données (30, 31 ou 32) est agencée pour envoyer une requête en transmission de service à l'unité de codage (MIPE).

14. Système selon la revendication 12 ou 13, **caractérisé en ce que** l'unité de codage (MIPE) optimise les trames dans un cas dans lequel la source de données (30, 31 ou 32) envoie une requête en transmission de service et que l'espace demandé par le service requis est plus grand que l'espace disponible dans les trames, telles que dans la fragmentation actuelle.

15. Système selon la revendication 14, **caractérisé en ce que** l'unité de codage (MIPE) est agencée pour transmettre un message d'annulation à la source de données (30, 31 ou 32), en réponse à la requête de transmission de service, dans le cas où l'espace additionnel fourni par l'optimisation des trames est plus petit que l'espace nécessaire pour la transmission du service requis.

16. Dispositif terminal, pour une réception d'une transmission IP ininterrompue, **caractérisé en ce que** le dispositif terminal comprend un récepteur (40 à 45) pour recevoir une transmission fragmentée en des trames, lesdites trames ayant été fragmentées en au moins deux trames, de manière que des paquets de données concernant le même service soient toujours logés dans la même trame, dans lequel l'une des au moins deux trames sert de pause dans la transmission pour l'autre trame.

17. Dispositif terminal selon la revendication 16, **caractérisé en ce que** le dispositif terminal est agencé pour syntoniser et mesurer une nouvelle fréquence durant la pause dans la transmission.

18. Dispositif terminal selon la revendication 16 ou 17, **caractérisé en ce que** le dispositif terminal est agencé pour resyntoniser l'ancienne fréquence, dans le cas où la nouvelle fréquence mesurée est d'une moindre qualité que l'ancienne fréquence.

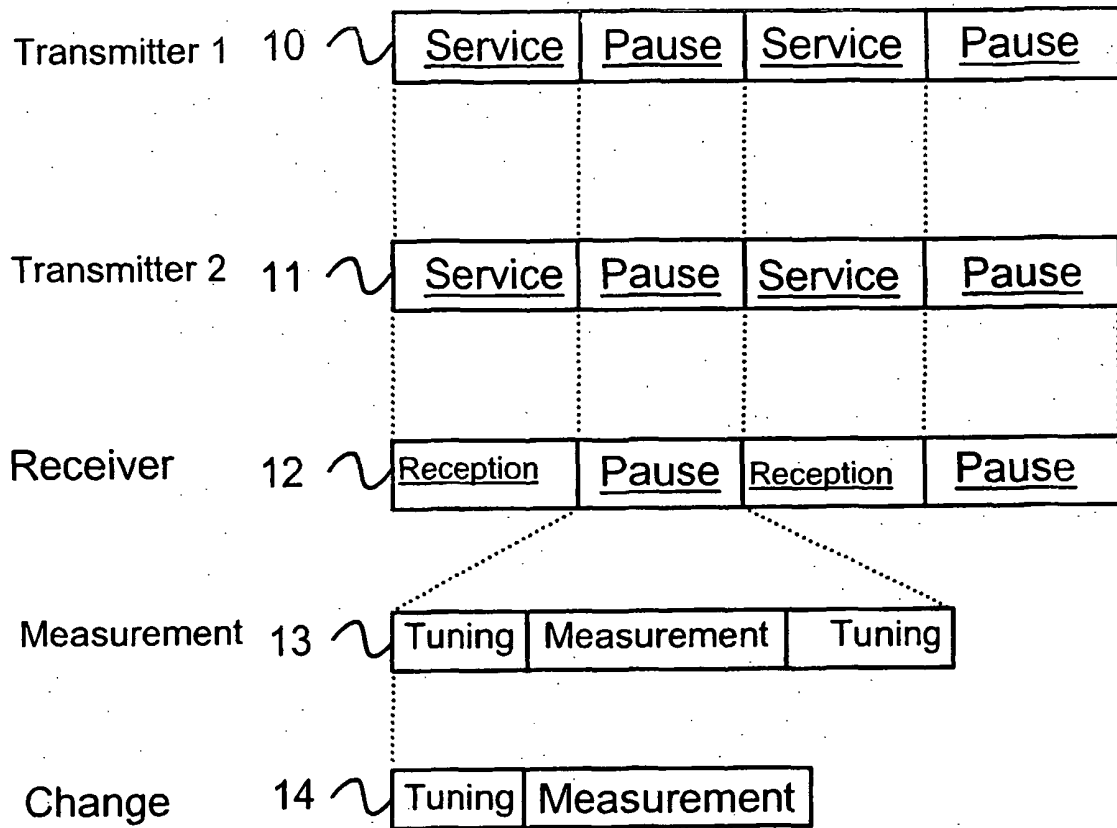


Fig. 1

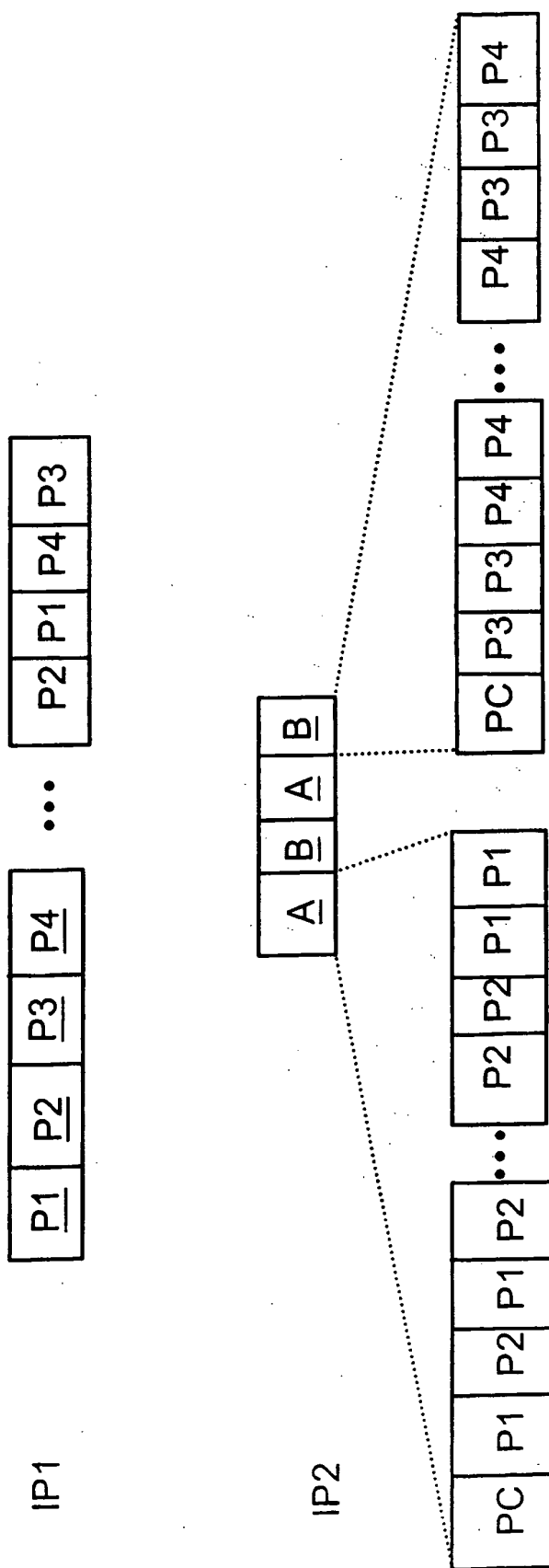


Fig. 2

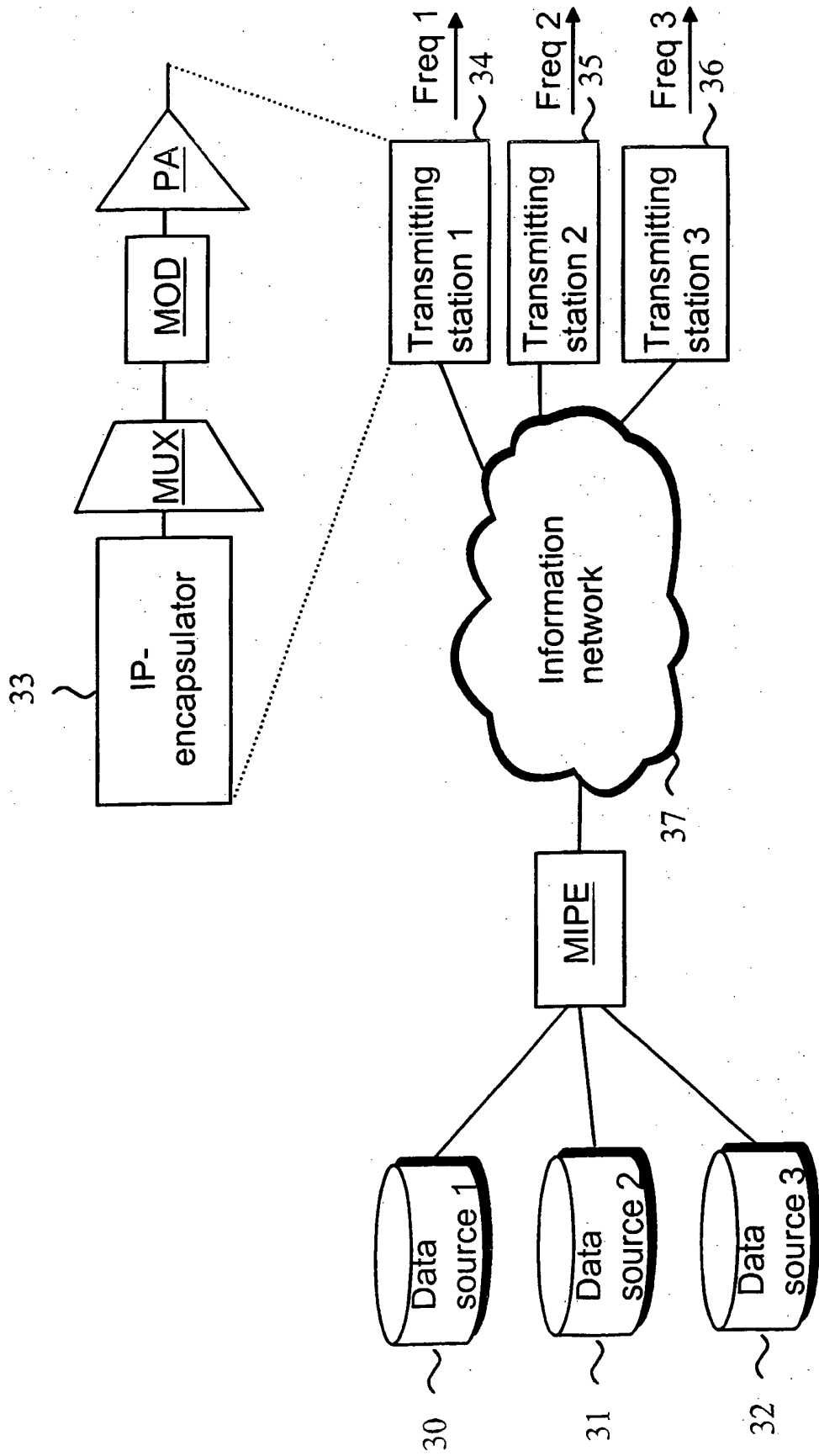


Fig. 3

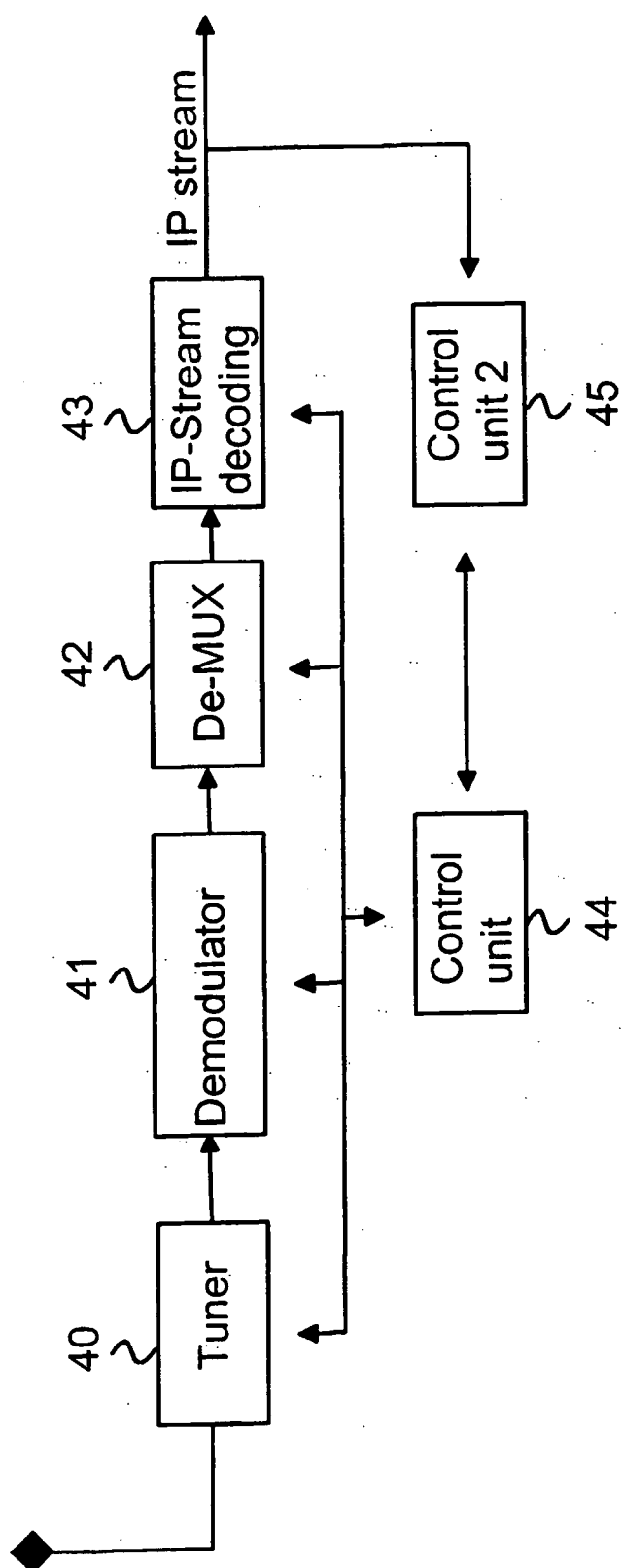


Fig. 4

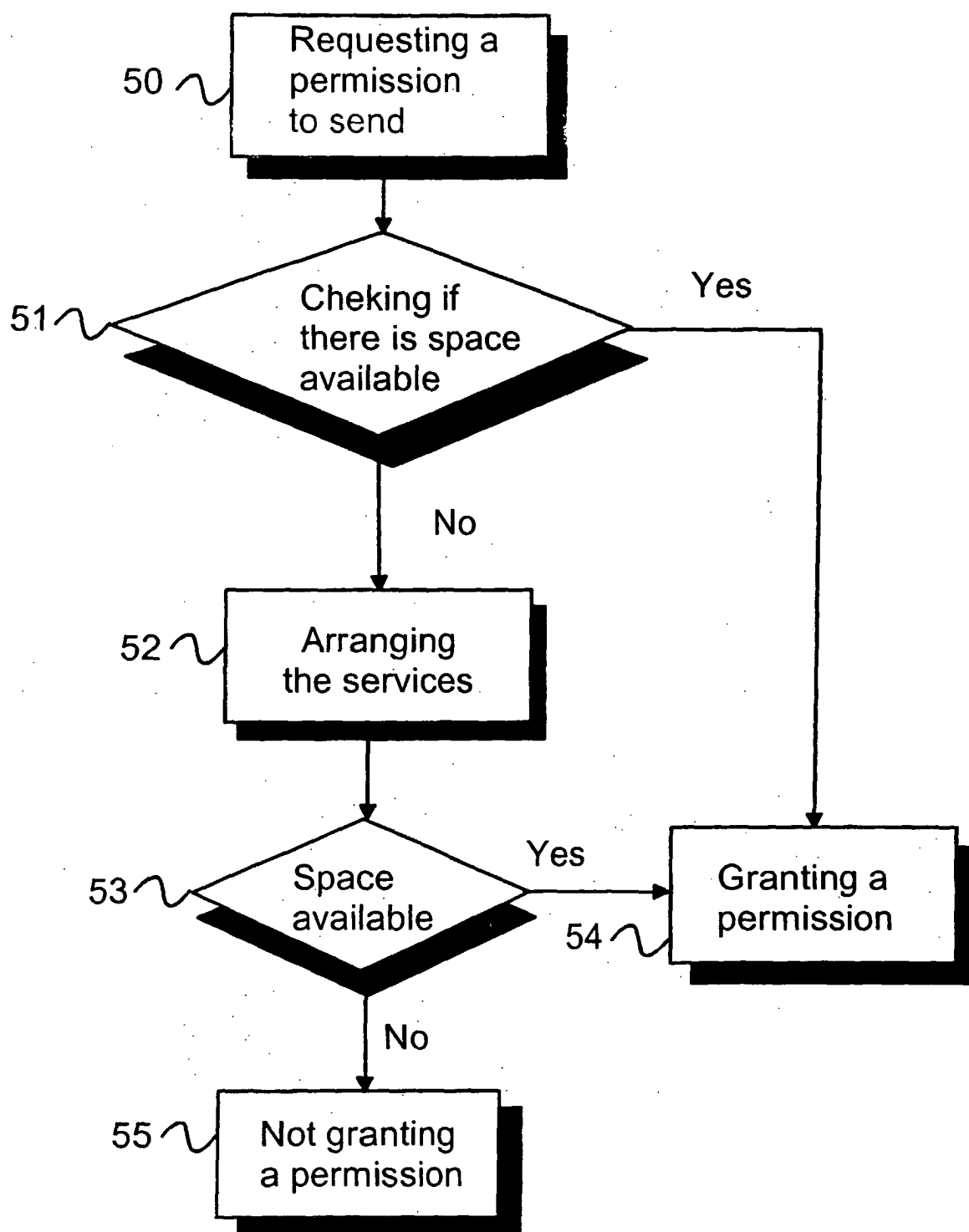


Fig. 5

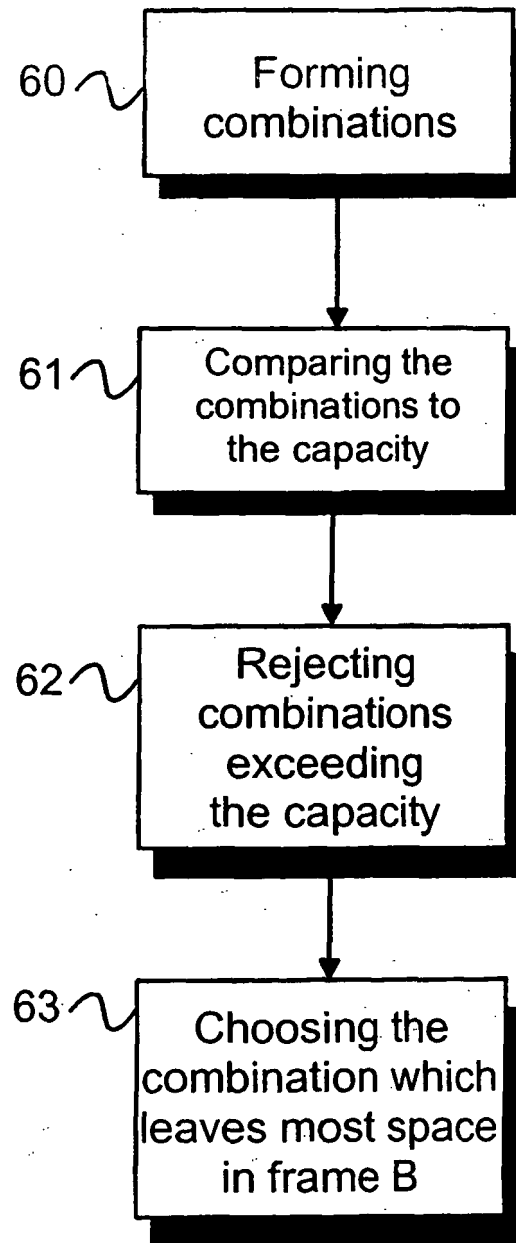


Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1073224 A2 [0006]