(54) Title: SYSTEM, METHOD AND COMPUTER PROGRAM PRODUCT FOR FLEXIBLE DISTRIBUTION OF TELETEXT INFORMATION

(57) Abstract: The present invention relates to a system (10) for flexible distribution of teletext information. The system (10) includes an extraction device (12) run/operated to from an analog and/or digital TV-source (14) separate teletext information (D), TV-signal(s) without teletext information (B) and subtitling (C). The system (10) also includes one to the extraction device (12) connected server device (16) which can be run/operated to store teletext information and metainformation about accessible information. The system (10) also includes a client terminal (18) connected to both the extraction device (12) and the server device (16). The client terminal (18) can be run/operated to receive the information as only unicast, broadcast, or as a combination of unicast and broadcast.
System, method and computer program product for flexible distribution of teletext information

Technical field

The present invention relates according to a first aspect to a system for flexible distribution of teletext information.

According to a second aspect, the present invention relates to a procedure for flexible distribution of teletext information.

According to a third aspect, the present invention relates to at least one computer program product for flexible distribution of teletext information.

Prior art

Teletext information, popularly called Teletext/data-TV/datavision, is an old but still used system, which is based on that data is transmitted in the analog TV-system.

With known systems, the teletext information is normally distributed included in the TV-signal. This fact applies to both analog and digital television. This means that the teletext information is transmitted to all customers, whether they are making use of it or not. The system often is experienced as slow by the user since there may be a long period of time before the page of topical interest is transmitted. With existing systems the user only can use Teletext on the channel he/she is watching.

The document WO-00/44 168 describes a system to transmit TV-programs to a plurality of customers, and further information which is connected with the TV-programs. The program is transmitted by use of video signals which have in them included an indication signal which indicates further accessible information. The indication signal can, for instance, include an address to a web site. At a typical user place, a receiver station includes a TV-set of standard type, a control box and a telephone set. The control box interprets the video signals
and includes a detector to detect the indication signal. When the indication signal is detected, the control box generates a reproduction/representation, preferably on the TV-set, which indicates the accessibility for/of the further information. The telephone set effects telephone communication of standard type and also access to Internet to make retrieval of the further information from the Internet site possible. When the address of an Internet site has been received, the control box transmits it to the telephone set. The telephone set then activates a modem, gains access to the Internet site, retrieves the information and transmits it to the control box. The control box receives the further information and transmits it to the TV-set to be reproduced/represented either together with the TV-program, or replacing the TV-program. One disadvantage with this system is that the user need further hardware, in form of, for instance, the control box. The document US-A1-2001/0044726 describes a procedure and a receiver to provide/distribute a film with speech in optional language. The invention can be implemented in a system including a TV- and/or a video device, an interface and a server device which can be connected to a translator studio. A user can control the TV- or video device and/or the interface by means of a remote control. If a user wants to watch a transmitted film with sound signals in a preferred language, the user can, by means of a language menu presented on a display on the TV- or video device, select the preferred language. The user's selection of language is evaluated in a device to effect identification information corresponding to the selected language and video data for the film which the user intends to watch. The identification information can include the title of the film or any other identification code extracted from, for instance, teletext data. The identification information is transmitted to the server device which, after processing of the identification information, will provide sound
translation data to the interface. The television or video device will provide video data received from a broadcast station in synchronization with from the server device received sound translation data, so that the user can watch the film with sound signals corresponding to the by the user selected language. In this system, certainly a solution is used which combines that the information is received as unicast and broadcast, but for a very specific application.

A disadvantage in common of the above presented solutions is that they are not very flexible, such as that the receiver cannot receive information as only unicast, only broadcast or as a combination of these.

Summary of the invention

It is an aim of the present invention to solve the above mentioned problems.

According to a first aspect of the invention, a system for flexible distribution of teletext information is effected. The system includes an extraction device which can be run/operated in order to from an analog and/or digital TV-source separate teletext information, TV-signal(s) without teletext information and subtitling. The system also includes one to the extraction device connected server device which can be run/operated to store the teletext information and metainformation about accessible information. The system also includes one to the extraction device and the server device connected client terminal which can be run/operated to receive the information as only unicast, only broadcast, or as a combination of unicast and broadcast. Some advantages of this system relatively to existing systems are that it is considerably more flexible, it combines unicast with broadcast and the result is a more flexible and more efficient transport of the information.
One advantage in this connection is achieved if the client terminal includes a selector device by which the user can select one of, or optional combination of, the following data flows: TV-signal(s) with teletext information from the TV-source, TV-signal(s) without teletext information from the extraction device, subtitling from the extraction device, teletext information from the server device, selected teletext information and metainformation from the server device and information regarding change, from the server device.

In this connection one advantage is achieved if the client terminal is a TV-terminal.

According to another embodiment one advantage is achieved if the client terminal also includes a web browser device.

In this connection one advantage is achieved if the web browser device includes a web browser connected to a conversion device for conversion of the received information into for the web browser suitable information.

One advantage in this connection is achieved if the by the selection device optional possibilities are presented/shown to the user on the client terminal in form of menus.

According to a second aspect of the present invention, a procedure for flexible distribution of teletext information is effected. The procedure includes the steps:

- to, from an analog and/or digital TV-source, separate teletext information, TV-signal(s) without teletext information and subtitling;
- to store the teletext information and metainformation about accessible information; and
- to, by means of a client terminal, receive information as only unicast, only broadcast or a combination of unicast and broadcast. Some advantages with this procedure relatively to existing procedures are that it is considerably more flexible, it combines broadcast with unicast and the
result is a more flexible and more efficient transport of information.

One advantage in this connection is achieved if a user via the client terminal can select one of, or optional combination of, the following data flows: TV-signal(s) with teletext information, TV-signals(s) without teletext information, subtitling, teletext information, selected teletext information and metainformation and information regarding change.

In this connection one advantage is achieved if the procedure also includes the steps:
- to receive TV-signal with teletext information by means of the client terminal from the TV-source;
- to, by means of the client terminal, select teletext information; and
- to, by means of the client terminal, select teletext information and metainformation from a storing device for rapid page loading of teletext information.

One advantage in this connection is achieved if the procedure also includes the steps:
- to, by means of the client terminal, receive TV-signal without teletext information,
- to, by means of the client terminal, receive subtitling;
- to, by means of the client terminal, select teletext information; and
- to, by means of the client terminal, receive selected teletext information and metainformation from a storing device for saving of bandwidth.

In this connection one advantage is achieved if the procedure also includes the steps:
- to, by means of the client terminal, receive TV-signal without teletext information; and
- to, by means of the client terminal, receive teletext information from a storing device to make
use of teletext information from another channel than the one the user at the present moment is watching via the client terminal possible.

One advantage in this connection is achieved if the procedure also includes the steps:

- to, by means of the client terminal, select teletext information; and
- to, by means of the client terminal, receive selected teletext information and metainformation from a storing device to make use of teletext information from another channel than the one the user at the present moment is watching possible.

In this connection one advantage is achieved if the storing device is a server device.

One advantage in this connection is achieved if the separation step is executed by means of an extraction device.

In this connection one advantage is achieved if the client terminal is a TV-terminal.

According to another embodiment one advantage is achieved if the client terminal also includes a web browser device.

In this connection one advantage is achieved if the web browser device includes a web browser connected to a conversion device for conversion of the received information into for the web browser suitable information.

One advantage in this connection is achieved if the selector steps are executed by the selectable options being presented/shown to the user on the client terminal in form of menus.

According to a third aspect of the present invention, at least one computer program product, which can be loaded directly into the internal memory of at least one digital computer is effected. The computer program product/products includes software code sections to execute the steps according to the procedure when said at least one
product is run on said at least one computer. By this at least one computer program product a flexible solution is effected which combines broadcast with unicast and results in a more flexible and more efficient transport/transmission of information.

It should be emphasized that when the term "include/including" is used in this application, it shall indicate the existence of said/indicated qualities, steps or components, but does not exclude the existence of one or more other qualities, parts, steps, components or groups of them.

**Brief description of the drawings**

Embodiments of the invention now will be described with reference to the enclosed drawings, where:

Figure 1 is a block diagram of a system 10 for flexible distribution of teletext information according to the present invention;

Figure 2 shows schematically the data flows which exist in the in Figure 1 shown system;

Figure 3 shows a flow chart of a procedure for flexible distribution of teletext information according to the present invention;

Figure 4 shows a flow chart of a first use of the present invention;

Figure 5 shows a flow chart of a second use of the present invention;

Figure 6 shows a flow chart of a third use of the present invention;

Figure 7 shows a flow chart of a fourth use of the present invention; and

Figure 8 shows a schematic picture of some computer program products according to the present invention.
Detailed description of embodiments

In Figure 1 a block diagram is shown of a system 10 for flexible distribution of teletext information according to the present invention. The system 10 includes an extraction device 12 which separates teletext information, TV-signal(s) without teletext information, and subtitling from an analog and/or digital TV-source 14. The system 10 also includes a server device 16 connected to the extraction device 12, which server device 16 stores the teletext information and metainformation about accessible information. The system 10 also includes a client terminal 18 connected to the extraction device 12 and the server device 16. The client terminal 18 can itself decide if it shall receive the information as only unicast, only broadcast, or as a combination of unicast and broadcast. The system 10 further can include one in the client terminal 18 included selector device 20, by which the user can select one of, or optional combination of, the possible data flows, which can be seen in Figure 2.

In Figure 2 are schematically shown the data flows which exist in the in Figure 1 shown system 10. The TV-source 14 transmits in ordinary way TV-signals with teletext information A which are received by both the extraction device 12 and the client terminal 18. The extraction device 12 separates the data flow A into three different data flows, namely TV-signals without teletext information B, subtitling C and teletext information D. As can bee seen in Figure 2, the client terminal 18 can receive these data flows B, C and D directly from the extraction device 12. The teletext information D is, in addition, transmitted to the server device 16. By means of the selector device 20 a user can for instance select wanted pages with teletext information, at which the server device 16 to the client terminal 18 transmits selected teletext information and metainformation E. The in Figure 2 shown arrow E is bi-directional because the transmission of
the data flow E is preceded by the selection, which occurs
in the opposite direction. The server device 16 also can
transmit information regarding change F to the client
terminal 18.

The metainformation is created by the server device 16
by means of activity analysis of the teletext information.

Below follows a description of how the in Figure 1 and
2 shown system 10 is working, and different ways in which
the system 10 can be used.

The system 10 according to the invention separates the
teletext information D from the TV-signal A. That part of
the teletext information which is considered as interesting
to all users (subtitling C) is transmitted in traditional
broadcast way – the larger amount of information is derived
as required from the server device 16 by the client
terminal 18. This means that bandwidth can be saved and
that all pages are stored on the server device 16 and for
that reason can be derived/retrieved immediately. The
teletext receiver, that is the client terminal 18, can show
information from just any channel. The presentation/showing
of teletext information is no longer depending on which
channel users are watching.

The system 10 stores the teletext information D on the
server device 16 in a format which makes possible correct
re-creation of all transmitted information. On the server
device 16 also metainformation about which content that is
accessible is stored. The receiver by that easily can have
a correct information about which information that is
accessible, that is, which pages and sub pages that are
active. That means that the user directly will have
indication about whether a page exists or not. The system
10 also makes it possible to get access to the teletext
information from other terminals than a TV, for instance an
ordinary web browser.
As can be seen in Figure 1 and 2, the system 10 according to the present invention primarily comprises three parts:

- The extraction device 12 extracts the teletext information from an analog or digital TV-source 14, forwards this to the server device 16 or directly to the client terminal 18. The extraction device 12 also can select a subset of information and transmit also this to the client terminal 18, for instance subtitling C. A TV-signal without teletext information B is also transmitted.

- The server device 16 stores the teletext information and metainformation about which pages that are accessible. The client terminal 18 can derive/retrieve metainformation and pages of teletext information E via unicast (today http). The server device 16 can transmit information about changes F to the client terminal 18 to eliminate unnecessary reading from the server device by the client terminal 18.

- The client terminal 18 presents, to the user, interfaces which are similar to the today existing interfaces. The client terminal 18 can receive its information from a mix of data flows A – F.

By selecting different combinations of data flows, different qualities of the system 10 according to the present invention can be achieved.

Below follows some examples:

- By using the data flow E in a traditional system with the data flow A, a rapid page loading is achieved.
By allowing that only the data flows B, C and E are reaching the user/customer, the capacity which would have been needed to transmit/transfer teletext information via broadcast can be saved - this without loosing in function. Thus bandwidth is saved.

By using data flows E or D, a user/customer can access teletext information from another channel than the one the user/customer is watching.

In Figure 3 a flow chart of a procedure for flexible distribution of teletext information according to the present invention is shown. The procedure starts at the block 30. The procedure then continues, at the block 32, with the step: To, from an analog and/or digital TV-source 14, separate teletext information D, TV-signal(s) without teletext information B and subtitling C. After that, the procedure continues, at the block 34, with the step: To store the teletext information D and metainformation about accessible information. The procedure then continues, at the block 36, with the step: To, by means of a client terminal 18, receive the information as only unicast, only broadcast, or as a combination of unicast and broadcast. The procedure then is finished at the block 38.

According to one preferred embodiment of the procedure according to the present invention, a user can, via the client terminal 18, select one of, or optional combination of, the following data flows: TV-signal(s) with teletext information A, TV-signal(s) without teletext information B, subtitling C, teletext information D, selected teletext information and metainformation E and information regarding change F.

In Figure 4 a flow chart of a first use of the present invention is shown. The procedure starts at the block 40. The procedure then continues, at the block 42, with the
step: To receive TV-signal with teletext information A by means of the client terminal 18 from the TV-source 14. After that, the procedure continues, at the block 44, with the step: To, by means of the client terminal 18, select teletext information. The procedure then continues, at the block 46, with the step: To, by means of the client terminal 18, select teletext information and metainformation E from a storing device. This results in rapid page loading of teletext information. The procedure then is finished at the block 48.

In Figure 5 a flow chart of a second use of the present invention is shown. The procedure starts at the block 50. The procedure then continues, at the block 52, with the step: To, by means of the client terminal 18, receive TV-signal without teletext information B. After that, the procedure continues, at the block 54, with the step: To, by means of the client terminal 18, receive subtitling C. The procedure then continues, at the block 56, with the step: To, by means of the client terminal 18, select teletext information. After that, the procedure continues, at the block 58, with the step: To, by means of the client terminal 18, receive selected teletext information and metainformation E from a storing device. The procedure then is finished at the block 60. This procedure results in that bandwidth is saved.

In Figure 6 a flow chart of a third use of the present invention is shown. The procedure starts at the block 70. The procedure then continues, at the block 72, with the step: To, by means of the client terminal 18, receive TV-signal without teletext information B. After that, the procedure continues, at the block 74, with the step: To, by means of the client terminal 18, receive teletext information D from a storing device. The procedure then is finished at the block 76. This procedure makes it possible
for a user to get access to teletext information from another channel than the one the user at the present moment is watching via the client terminal 18.

It should be emphasized that with the system 10 according to the present invention it will be possible to show teletext information on the client terminal 18 regarding a TV-channel which at the present moment does not transmit any teletext information.

In Figure 7 a flow chart of a fourth use of the present invention is shown. The procedure starts at the block 80. The procedure then continues, at the block 82, with the step: To, by means of the client terminal 18, receive TV-signal without teletext information B. After that, the procedure continues, at the block 84, with the step: To, by means of the client terminal 18, select teletext information. The procedure then continues, at the block 86, with the step: To, by means of the client terminal 18, receive selected teletext information F from a storing device. The procedure then is finished at the block 88. This procedure makes it possible for a user to get access to teletext information from another channel than the one that the user at the present moment is watching via the client terminal 18.

In Figure 8 a schematic picture of some computer program products according to the present invention is shown. In Figure 8 n different digital computers 100₁,...,100ₙ, and n different computer program products 102₁,...,102ₙ, are shown which can be loaded directly into the internal memory of said computers 100₁,...,100ₙ. Each 102₁,...,102ₙ includes software code sections to execute some or all steps according to Figure 3 when the product/products 102₁,...,102ₙ are run on the computer/computers 100₁,...,100ₙ. The computer program products 102₁,...,102ₙ can, for instance, be in form of diskettes, RAM-disks, magnetic
tape, optomagnetic disks, or any other suitable products. The computer program products in addition can be distributed via some form of computer network.

It should be emphasized that the change of flow F per channel can be used to minimize the data flow E.

The above described system 10 according to the present invention can be applied in many different ways and with many different types of networks. Below some ways are exemplified to apply this system 10.

In this example all transmission/transport of data is made over computer network (IP). In this case the system 10 is used to make loading of pages by means of the data flow E more rapid. Updatings the client terminal will have from the in the TV-signal included teletext information, that is, via the data flow A.

In another example all teletext information is received via the system 10. In this example the client terminal 18 does not receive the data flow A. On the other hand, the client terminal 18 makes use of the data flow B to receive the TV-signal. In addition, the client terminal 18 receives the data flows C, E and F. The point of it here is that the client terminal 18 does not all the time need to receive all teletext information but only that which the user is interested in (subtitling and selected pages) and that the client terminal can receive teletext pages from a channel which is not the channel the data flows B- and C of which are received.

In another example the distribution is made over a combination of computer network and digital TV-network. In a digital TV-network, the data flow A in Figure 2 is divided into the data flows A1 and A2, both including TV-signal(s) with teletext information. The data flow A1 is passing via the digital TV-network (DVB-T, DVB-C or DVB-S) to the client terminal 18. The data flow A2 is coming in to
the extraction device 16 via another network, which can be a computer network or a digital TV-network. In this case the client terminal (for instance a digital TV-receiver) is using the system primarily to increase the speed at deriving/retrieving of pages (the data flow E). Updating of pages the client terminal 19 can get either via the data flow A1 or F. The data flows F and E are passing via the back channel of the client terminal 18 (which is capable of bi-directional transmission). The advantage/gain here is that loading of pages will be more rapid and that the client terminal 18 can receive teletext pages from a channel which is not the channel the A1-flow of which is received.

In this example system 10 is used to make possible for the client terminal 18 to show teletext pages from another channel than the one that is transmitted. The client terminal 18 receives the data flows B and C from the channel the TV-signal of which shall be shown, the data flow F from the channel the teletext information of which is wanted and uses the data flow E to get the metainformation and the selected teletext pages. The point of it here is that loading of pages is made more rapid and that the client terminal 18 need not receive teletext pages from a channel which is of no interest. In a traditional system, the client terminal might have had to receive an extra A-data flow in order to receive teletext information from another channel than the one the TV-signal of which is shown.

The invention is not limited to the above described embodiments. It will be evident that many different modifications are possible within the scope of the enclosed patent claims.
1. A system (10) for flexible distribution of teletext information, which system (10) includes an extraction device (12) arranged to, from an analog and/or digital TV-source (14), separate teletext information, TV-signal(s) without teletext information and subtitling, one to the extraction device (12) connected server device (16) arranged to store the teletext information and metainformation about accessible information, and one to the extraction device (12) and the server device (16) connected client terminal (18) arranged to receive the information as only unicast, only broadcast, or as a combination of unicast and broadcast.

2. A system (10) for flexible distribution of teletext information as claimed in patent claim 1, characterized in that the client terminal (18) includes a selector device (20) by which the user can select one of, or optional combination of, the following data flows: TV-signal(s) with teletext information (A) from the TV-source (14), TV-signal(s) without teletext information (B) from the extraction device (12), subtitling (C) from the extraction device (12), teletext information (D) from the server device (16), selected teletext information and metainformation (E) from the server device (16), and information regarding change (F) from the server device (16).

3. A system (10) for flexible distribution of teletext information as claimed in patent claim 1 or 2, characterized in that the client terminal (18) is a TV-terminal (18).
4. A system (10) for flexible distribution of teletext information as claimed in patent claim 1 or 2, characterized in that the client terminal (18) also includes a web browser device.

5. A system (10) for flexible distribution of teletext information as claimed in patent claim 4, characterized in that the web browser device includes a web browser connected to a conversion device for conversion of the received information into information suitable for the web browser.

6. A system (10) for flexible distribution of teletext information as claimed in any of the patent claims 2-5, characterized in that the selector device (20) selectable options are presented/shown to the user on the client terminal (18) in form of menus.

7. A procedure for flexible distribution of teletext information, which procedure includes the steps:
   - to, from an analog and/or digital TV-source (14), separate teletext information, TV-signal(s) without teletext information and subtitling;
   - to store the teletext information and metadata about accessible information; and
   - to, by means of a client terminal (18), receive the information as only unicast, only broadcast, or as a combination of unicast and broadcast.

8. A procedure for flexible distribution of teletext information as claimed in patent claim 7, characterized in that a user via the client terminal (18) can select one of, or optional combination of, the following data flows: TV-signal(s) with teletext
information (A), TV-signal(s) without teletext information (B), subtitling (C), teletext information (D), selected teletext information and metainformation (E) and information regarding change (F).

9. A procedure for flexible distribution of teletext information as claimed in patent claim 8, characterized in that the procedure also includes the steps:
   - to receive TV-signal with teletext information (A) by means of the client terminal (18) from the TV-source (14);
   - to, by means of the client terminal (18), select teletext information; and
   - to, by means of the client terminal (18), select teletext information and metainformation (E) from a storing device for rapid page loading of teletext information.

10. A procedure for flexible distribution of teletext information as claimed in patent claim 8, characterized in that the procedure also includes the steps:
    - to, by means of the client terminal (18), receive TV-signal without teletext information (B);
    - to, by means of the client terminal (18), receive subtitling (C);
    - to, by means of the client terminal (18), select teletext information; and
    - to, by means of the client terminal (18), receive selected teletext information and metainformation (E) from a storing device for saving of bandwidth.
11. A procedure for flexible distribution of teletext information as claimed in patent claim 8, characterized in that the procedure also includes the steps:
- to, by means of the client terminal (18), receive TV-signal without teletext information (B); and
- to, by means of the client terminal (18), receive teletext information (D) from a storing device to make use of teletext information from another channel than the one the user at the present moment is watching via the client terminal (18) possible.

12. A procedure for flexible distribution of teletext information as claimed in patent claim 8, characterized in that the procedure also includes the steps:
- to, by means of the client terminal (18), select teletext information; and
- to, by means of the client terminal (18), receive selected teletext information and metainformation (E) from a storing device to make use of teletext information from another channel than the one which the user for the present moment is watching via the client terminal (18) possible.

13. A procedure for flexible distribution of teletext information as claimed in any of the patent claims 9-12, characterized in that the storing device is a server device (16).

14. A procedure for flexible distribution of teletext information as claimed in any of the patent claims 7-13, characterized in that the separation step is executed by means of an extraction device (12).
15. A procedure for flexible distribution of teletext information as claimed in any of the patent claims 7-14, characterized in that the client terminal (18) is a TV-terminal (18).

16. A procedure for flexible distribution of teletext information as claimed in any of the patent claims 7-14, characterized in that the client terminal (18) also includes a web browser device.

17. A procedure for flexible distribution of teletext information as claimed in patent claim 16, characterized in that the web browser device includes a web browser connected to a conversion device for conversion of the received information into for the web browser suitable information.

18. A procedure for flexible distribution of teletext information as claimed in any of the patent claims 8-17, characterized in that the selection steps are executed by the selectable options being presented/shown to the user on the client terminal (18) in form of menus.

19. At least one computer program product (102₁, ..., 102ₙ) directly loadable into the internal memory of at least one digital computer (100₁, ..., 100ₙ), including software code sections to execute the steps according to the patent claim 7 when said at least one product (102₁, ..., 102ₙ) is run on said at least one computer (100₁, ..., 100ₙ).
START

Separate

Store

Receive

END

Fig. 3
Fig. 5
Fig. 6
START

Receive data flow (B)

Select teletext information

Receive data flow (E)

END

Fig. 7
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

**IPC7:** H04N 5/445, H04N 7/088

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)

**IPC7:** H04N

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

SE, DK, FI, NO classes as above

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

EPO-INTERNAL, WPI DATA, PAJ, INSPEC, COMPENDEX, TDB

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tr>
<td>X</td>
<td>US 6239843 B1 (GAUDREAU, J.E.), 29 May 2001 (29.05.01), column 4, line 63 - line 67; column 5, line 29 - line 63, abstract</td>
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<td>A</td>
<td>US 5748736 A (MITTRA, S.), 5 May 1998 (05.05.98), column 1, line 64 - line 66; column 5, line 28 - line 32; column 5, line 42 - line 46, abstract</td>
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<td>A</td>
<td>US 6239844 B1 (RAIYAT, F.), 29 May 2001 (29.05.01), column 1, line 17 - line 45; column 4, line 30 - line 35, abstract</td>
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[X] Further documents are listed in the continuation of Box C.  [X] See patent family annex.

- "A": document describing the general state of the art which is not considered to be of particular relevance
- "B": earlier application or patent but published on or after the international filing date
- "L": document on which priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O": document referring to an oral disclosure, use, exhibition or other means
- "P": document published prior to the international filing date but later than the priority date claimed
- "T": later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X": document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y": document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

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## INTERNATIONAL SEARCH REPORT

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