

The invention relates to a method of processing signals in a receiver end device having a mode of operation which is controllable on the transmitter end according to the preamble of claim 1 and a receiver end device for carrying out the method.

The method mentioned at the outset and the device mentioned at the outset serve for example to facilitate proper reproduction and recording of the transmission identified by the relevant code signal. The identification signal is transmitted as an additional piece of data to the sound and/or video signal, say by means of an "auxiliary carrier", a "data line" in the video signal or the like. Several methods of transmission have been proposed for this in the Federal Republic of Germany. In the television sector this type of transmission system was recently introduced under the title Video Program System (VPS). For radio transmissions comparable methods are known under the title Radio Data Service (RDS). An identification signal, the "VPS and/or "RDS" signal, identifying a transmission is transmitted in both cases for each transmission, and is compared at the receiver end with a coding programmed by the user. Such an identification signal contains data about the anticipated beginning of transmission and about the station broadcasting the relevant transmission. When there is agreement a switching voltage is produced which switches on the receiving device exactly at the actual starting time of the transmission and exactly for the actual duration of the transmission. If a desired transmission is displaced for example for special reasons, then switching on the receiving device for the desired transmission is appropriately delayed. If finally the envisaged programme begins at a later time, then it is received and/or recorded - controlled by the identification signal - exactly during its actual duration.

From EP-A-O 118 104 a method in the same field is known for a receiving device in entertainment electronics. A "time window" is associated with programmed transmissions in this known receiving device in order that the circuits lying in the transmission signal path of the receiving arrangement do not have to remain permanently switched on including the circuit for recognising the characterising identification signal. In this known device it is disadvantageous that possible time overlapping of recording jobs is not taken into account.

The storage device serving for storing identification signals characterising transmissions and/or switch on or off times is generally designated as a timer. The respectively received identification signal is fed by a identification signal decoder to the timer, it compares the stored data with the corresponding data of the identification signal and during the whole duration of agreement of the stored data with the corresponding data of the identification signal effects the operation of the receiver end device.

If coded data from several transmissions can be stored in a timer, then due to programme shifts there may be time overlaps which could not be foreseen at all when programming the timer. For example if a first programmed transmission is shifted so much that its beginning is later in time than the beginning of a second programmed transmission, then initially (the appliance) is switched over to the broadcast programme relating to the second transmission and the appearance of the identification signal associated with this second transmission is waited for. However this has the result that the first transmission is "forgotten" and no longer received and/or recorded, even if its actual beginning should be after the actual end of the second transmission. Therefore, it has already been proposed to interrogate cyclically the timer store after the end of a recording job, wherein the stored identification signal data is switched to one after another. However, the PLL circuit present for tuning has to be switched over to the relevant receiving channels. This switch over however causes faults, if at the same time another broadcast receiver is operated, for example the user watches a television programme and at the same time transmissions are automatically recorded with a video recorder.

The object underlying the invention is to pick up these "forgotten" programmes nonetheless - even if only in fragments in some circumstances - and to avoid the said faults.

This object is achieved by the measures provided in Claim 1. This object is also achieved by measures provided in claim 11.

Further advantages and features of the invention are described below using two embodiments together with the drawings. In which:

Fig. 1 shows a block circuit diagram of a video recorder in accordance with the invention and

Figures 2 and 3 show timing charts for explaining the mode of operation of the invention.

In a video recorder shown in Fig. 1 in a block circuit diagram television signals received via an antenna 1 are selected via a tuner 2 and are passed to stages not shown in greater detail via an intermediate frequency amplifier 3 for further processing of picture, sound and synchronous signals in the direction of the FBAS arrow and are finally stored via recording heads on to a magnetic tape.

The television signals contain an identification signal characterising a transmission during the whole duration of this transmission, the "VPS signal". As long as data stored in a timer 6 agrees with the corresponding data of the VPS signal, the recording of this transmission is effected. A VPS decoder 5 serves to decode the VPS data. The VPS data stored away in the timer 6 is compared continuously with the received VPS data in a comparison stage 7.

If the appropriate data agrees the comparison stage 7 emits a signal which sets recording operation of the video recorder in motion via a switching stage.

If a transmission identified by a VPS signal fails or is late and if the timer is switched over to a different transmission, then the VPS data not (yet) received and stored away in the timer 6 is deposited in an additional store 10.

At the end of a transmission the VPS signal associated with this transmission also terminates so that the recording operation is stopped. At the same time a further comparison stage 11 is activated via the switching stage 8, said stage 11 comparing the data deposited in the additional store 10 with the VPS data coming from the VPS decoder 5. This second comparison stage 11 only goes into action if a transmission has already been recorded. This may be achieved by a signal closing a switch 4, said signal being taken from an electronic control unit 9 for a tape transport motor M of the video recorder, so that the comparison stage 11 is only activated from this point in time on.

If later the VPS signal deposited in the additional store 10 appears at the output of the VPS decoder 5, then the recording operation is set in motion again via the switching stage 8. In this way a programme stored away in the timer 6 for an earlier point in time comes to be recorded, although the timer regards this earlier deadline as expired.

In the above embodiment the case is described wherein the VPS data contained in the timer 6, whose associated transmissions have not (yet) been recorded, is stored in the additional store 10.

In another embodiment not shown here in greater detail it is provided that the VPS data of the relevant not (yet) recorded transmission is not transferred into the additional store 10 but rather only the "address" of the respective storage space in the timer 6, under which this VPS data is stored. This has the advantage that as compared to the previously described embodiment considerably less comprehensive data has to be stored in the

additional store 10, this additional store may therefore be formed "smaller" and thus more cheaply. In such a case it is also possible to do without the described second comparison stage 11. Instead of this, after completing a recording job the additional store 10 is interrogated cyclically for the addresses of storage spaces of the timer 6, which do not (yet) contain received VPS data, say via the switching stage 8. If there are such addresses in the additional store 10, then the address of the timer 6, which is stored in the additional store 10 in the first position, is called up. This VPS data stored in the timer 6 under this address is compared continuously with the received VPS data in the comparison stage 7, once the tuner 2 has been set automatically beforehand to the related frequency according to the data stored in the timer 6.

With the aid of Figures 2 and 3 the mode of operation of the invention is illustrated with timing charts, in which other reference symbols than re Fig. 1 are used for the purpose of clarity.

For 5 transmissions the respective switch-on times and/or identification data VPS1 - VPS5 were fed into a timer designated T in Fig. 2 and were stored in the timer T at storage places T1 - T5.

At each point in time  $t_1$ , which is for example 10 minutes before the anticipated beginning of the transmission, the receiving part 2,3,5 of the video recorder switches itself on and waits for the VPS data VPS1. As a result of a programme shift the transmission associated with this VPS data may however only be transmitted at a later point in time  $t_4$ . This transmission with the VPS data VPS1 would be recorded at this point in time when the timer would have switched over the tuner 2 at the time  $t_2$  not to the transmitter which is stored in the timer place  $t_3$  and relates to the next following transmission - according to the anticipated beginning of transmission or the programmed switch-on time -, from which transmitter the transmission is to be broadcast with the data VPS2. The receiving part now waits for the VPS data VPS2. According to the invention at the time  $t_2$  the content or the address of the timer memory T1 is deposited in a further memory device S at its first storage place S1.

At a time  $t_3$  the VPS data VPS2 could not yet be received because of a programme shift of this transmission to. The timer now again switches over the tuner to a different transmitter and deposits the data VPS2 or the address of the timer place T3 at the storage place S2 of the memory device S.

At a time  $t_4$  broadcasting the transmission which was announced for an earlier time and was identified with the data VPS1 is

begun from the related transmitter.

The actual start and actual end of programmes are identified in Fig. 2 by square brackets. The time portions which are recorded are particularly highlighted by a horizontal double bar.

At a time  $t_5$  the receiving part still had no VPS data from the transmission identified by VPS3. The receiving part is now switched over by the timer T in turn to a pre-programmed transmitter, one transmission of which is expected with the data VPS4, once the data VPS3 or the address of the timer place T2 has been previously deposited in the memory S at the storage place S3.

The transmission with the data VPS4 begins in the example shown actually at the anticipated time, so that at the time  $t_5$  the first recording I begins.

At a time  $t_6$  the late transmission identified at the transmitter end by VPS3 begins, but which does not become recorded, since the recording with take I is still running.

Even the transmission beginning late at time  $t_7$  and with the data VPS2 does not affect the recording with take I, it is ended at time  $t_8$  which corresponds to the actual end of the transmission. The end of this take I serves as a criterion for interrogating the memory S for transmissions which have not yet expired, while the memories S1 - Sn are interrogated cyclically.

In the example shown it is established that the transmission with the data VPS1 is still transmitted so that there is switch over to this transmission and in conjunction with take I the remainder of the transmission identified with the data VPS1 arrives on the magnetic tape for recording as take II.

At a time  $t_9$  the transmission with the data VPS1 ends and the take II is therefore ended, whereupon the memory S is further interrogated and it is established that the transmission with the data VPS2 is still being broadcast at the time. The last part of this transmission is therefore recorded as take III. At the end of this take III at a time  $t_{11}$  the memory S is again interrogated, and it is established that the transmission with the identification VPS3 has not yet been recorded. This transmission can no longer be recorded however, since at the time  $t_{10}$  it has already ended. The timer T of the video recorder now switches over at time  $t_{12}$  to the transmission with the data VPS5, which begins in the present example at the anticipated time and reaches the magnetic tape as take IV.

This invention becomes particularly effective when for example a pre-programmed transmission is displaced to the end of the transmission time of a transmitter, which is often the case, when a special programme is incorporated. This case is described in the following with the aid of Figure 3.

At a time  $t_1$  by means of the timer the transmission with the data VPS1 is switched on, which is pre-programmed in the timer place  $t_1$  and should be broadcast from the time  $t_2$  to the time  $t_3$ . Since a current transmission from the transmitter 1 which is not pre-programmed in the timer is inserted into the program routine at the time  $t_2$ , the expected data VPS1 does not appear. The inserted programme lasts until the time  $t_4$ . At the time  $t_5$  the timer switches over to the channel and transmission time of the transmission with the data VPS2. This transmission ends at the time  $t_6$ .

With switch over to the new transmitter the data VPS1 are placed into the memory S at the storage place  $S_x$ . From the time  $t_6$  the memory S is interrogated and it is established that the transmission with the data VPS1 has not yet been recorded. The timer therefore switches over to this transmission which is broadcast at the time  $t_7$  and is recorded until the end  $t_8$  of transmission. It is recognised that despite inserting a current programme in the time from  $t_2 - t_4$  the transmission displaced to a later time  $t_7 - t_8$  nevertheless comes to be recorded.

Provision of the second memory S has the advantage - as is particularly clear in the description re Fig. 2 - that the VPS data of overdue, not yet expired transmissions do not have to be subjected again to a comparison operation in order to establish in which sequence the related recording jobs are to be finished or interrogated according to the anticipated beginning of the transmission. Rather in the memory S it is already deposited in which sequence the timer storage places - in which data of not yet expired transmissions are stored - are to be interrogated. Therefore, not all VPS data needs to be deposited in the memory S, it is sufficient to deposit there the addresses of the timer storage places  $T_1, T_2, \dots$ , in which this VPS data are to be found. The space requirement in the additional memory S is therefore relatively small.

An additional advantage arises if the timer T can be so programmed that a daily or weekly recording job can be fed in to one of its storage places. Such a job may for example consist in that a certain news programme is to be recorded daily. Even in such programmes broadcast punctually in general there may be programme shifts, for example because of special sport programmes. If at the anticipated time the VPS signal associated

with this transmission is not present and it is necessary to switch over because of a different recording job now to be carried out, then the VPS data of the daily recording job and/or the address of the relevant storage place of the memory T is deposited in the additional memory S. Once the recording job which has become current in the meantime is complete, as described above the memory S is interrogated for transmissions which have not yet been finished. In the cyclically occurring interrogation of the storage places S1-Sn it is then established that the daily recording job has not yet been finished, so that with the related VPS data there is switchover to the appropriate transmitter and (the machine) waits for these VPS data - possibly renewed - to appear.

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1. A method of processing signals in a receiver end device, more particularly in an audio and/or video recorder and/or receiver, with a mode of operation which is controllable from the transmitter end by an identification signal which characterises this transmission and is transmitted during the whole duration of a transmission, and with a programmable memory (timer T) into which are fed identifying data which are contained in the identification signal and are required for operation in the controllable mode of operation, **characterised in that** a second memory device (S) is provided in which upon switching over to a subsequent programmed transmission data are stored automatically in the second memory device (S), said data relating to the previously expected transmission, as long as nothing has been received from this transmission, and that after expiry of a received transmission and before switch over to a subsequent programmed transmission there is switch over automatically initially to a transmission characterised by the data stored in the second memory device (S).
  2. A method according to claim 1, **characterised in that** in the second memory device (S) data are stored only for those transmissions for which nothing has yet been stored in the second memory device (S).
  3. A method according to claim 1 or 2, **characterised in that** the data stored in the second memory device (S) are stored in a manner (S1, S2, ..., Sn) which can be polled according to the sequence of the related transmissions.
  4. A method according to any one of the preceding claims, **characterised in that** on the occasion of receiving a transmission, for which data are stored in the second memory device (S), a suitable identification takes place in the second memory device (S) or the relevant data are erased.
  5. A method according to any one of the preceding claims, **characterised in that** the data stored in the second memory device (S) correspond to the identification data stored in the timer (T) of the relevant transmissions.
  6. A method according to any one of claims 1 to 4, **characterised in that** the data stored in the second memory device (S) correspond to the respective addresses of the storage places (T1, T2, ..., Tn) of the data stored in the timer (T) of the relevant transmissions.
  7. A method according to any one of the preceding claims **characterised in that** switching over to an immediately subsequent programmed transmission takes place when its anticipated beginning of transmission is reached or a predetermined time before it is reached.
  8. A method according to any one of the preceding claims, **characterised in that** the controllable mode of operation corresponds to the transmitter controlled reproduction and/or recording of the relevant transmission.
  9. A method according to any one of the preceding claims, **characterised in that** once there is switchover to the second memory device (S) and until receipt of a transmission characterised by the data stored there (S1, S2, ..., Sn), but at most until a complete interrogation cycle has been completed in



relation to the further memory device (S) the data (S1, S2, ..., Sn) stored in the further memory device (S) are called up once in each case.

10. A method according to claim 9, characterised in that then there is switchover to a programmed transmission predetermined by its sequential position or storage place.

11. A receiver end device, more particularly an audio and/or video recorder and/or receiver, with a mode of operation which can be controlled from the transmitter end by an identification signal which characterises this transmission and transmitted during the whole duration of a transmission and with a programmable memory (timer T) into which are fed identifying data which are contained in the identification signal and are required for operation in the controllable mode of operation, characterised in that a second memory device (S) is provided which is connected to the programmable memory (T), said memory device receiving data automatically for storage from the programmable memory (T) upon its switchover to a subsequent programmed transmission, said data relating to the previously expected transmission, as long as nothing has been received from this transmission, and that a comparison stage (11) is provided connected with the second memory device (S) said stage, after expiry of a received transmission and before a switchover to a subsequent programmed transmission, comparing the data stored in the second memory device (S) with the data supplied to it from a VPS decoder (5) for agreement, and if there is agreement causes switchover of the receiver end device into the controllable mode of operation.

