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Method of shortening the access time

The invention relates to a method of shortening the access time when using a recording medium.

In a CD player, an optical scanning device scans the items of data in a rotating disc-shaped recording medium, the so-called compact disc, by means of a light beam. The light beam scanning the items of data is guided along the spiral-like data tracks on the disc by means of a tracking control loop.

In order for someone using a CD to be able to listen to a piece of music that he wants to hear, the optical scanning device is guided as quickly as possible from its present position to the track on which the wanted piece of music begins. During this process, which will be referred to as track-jumping, the light beam crosses a plurality of data tracks; it jumps from the track that is currently being scanned to the target track. The quicker the track-jumping, the shorter the access time, the time that the user must wait until he can hear the wanted piece of music.

Short access times are of much greater significance in a data system than in the case of a CD player. In a recording and/or reproduction equipment which is equipped with a CD-ROM as a data store, short access times are a basic indication of the quality. The access time may vary between approximately 100 msecs and some seconds in dependence on the equipment and the disc.

Consequently, the object of the invention is to considerably shorten the access time.

The invention, a method of shortening the access time when using a recording medium in which the recorded items of data are divided into groups, achieves this object in that, the first n items of data of each group are initially stored in a store after the recording medium has been inserted into a recording and/or reproduction equipment, that upon reading the items of data of a group, the items of data that have been placed in the store are read-out first, during which time, the scanning device

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of the recording and/or reproduction equipment searches for this group, that after this group has been found, the items of data that have been placed in the store are no longer read-out but instead, the items of data delivered by the scanning device are read out.

A second way of achieving this object envisages that the first n items of data from a portion of the groups are initially stored in a store after the recording medium has been inserted into a recording and/or reproduction equipment, that upon reading the items of data of a group, the items of data that have been placed in the store are read-out first, during which time, the scanning device of the recording and/or reproduction equipment searches for this group, that after this group has been found, the items of data that have been placed in the store are no longer read-out but instead, the items of data delivered by the scanning device are read out and that the first n items of data of the remaining groups are stored in the store in the pauses between reading the items of data from the second groups.

An arrangement for carrying out the method in accordance with the invention is shown in the Figure.

The invention will now be described and explained in exemplary manner with the help of the Figure and a CD player.

When a disc CD is inserted into the CD player, a control circuit ST initially causes an optical scanning device A, which scans the disc CD using a light beam L, to go successively to the beginning of each one of the pieces of music in order to read the first n items of data of each one of the pieces of music. These first n items of data of each one of the pieces of music are then stored in a store S. When the process of storing the first n items of data of each group in the store S is over, the CD player is ready to function. The disc can now be played back.

If the person using a CD wishes to listen to a piece of music for example, then the read out of the first n items of data of this piece of music that have been placed in the store S is

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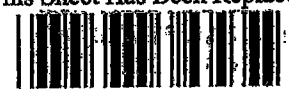
immediately begun, the optical scanning device meanwhile searching the disc CD for the beginning of the piece of music which is wanted by the listener. A synchronising circuit SY passes on the items of data that have been read from the store S. Meanwhile, the control circuit ST moves the optical scanning device A to the beginning of the wanted piece of music on the disc CD so that the reading of the items of data from the disc CD can be begun. The flow of data coming from the store S is synchronised with the data flow from the optical scanning device A in the synchronising circuit SY. As soon as the two data streams are synchronised, the synchronising circuit SY no longer passes on the items of data coming from the store S but rather, the items of data delivered by the optical scanning device A.

The user immediately hears that piece of music which he wants, because the first n items of data of each one of the pieces of music have been placed in a store. The access time has become virtually zero. The optical scanning device has sufficient time to search the disc for the wanted piece of music while the items of data are being read out from this store S. After the items of data coming from the store and the items of data delivered by the scanning device are synchronised, there is a change over to the items of data delivered by the scanning device. The listener does not notice this switching process.

It is quite sufficient to store the first n items of data from only a portion of the groups or the pieces of music in order to achieve a shortening of the access timees. The access times for those groups whose first n items of data have been placed in the store are shortened; the access times for the remaining groups however are not shortened.

In accordance with the second solution in accordance with the invention, the first n items of data from only a portion of the groups or pieces of music are initially stored. The first n items of data from the remaining pieces of music are stored during the pauses between two pieces of music and while the CD player is in the pause mode.

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However, instead of the individual pieces of music, one may be concerned with other groups of arbitrary data items. The recorded items of data may, for example, be divided into a plurality of groups on a CD-ROM, a once writable compact disc. The first n items of data from each group are stored in the store after the disc has been inserted. It is useful to choose n to be large enough for the scanning device to have sufficient time on each occassion to find the beginning of those groups whose items of data it is intended to read. However, it is not necessary to place the same number of items of data in the store for each group.

In the case of a first embodiment of the invention, provision is made for storing the items of data from the first revolution for each group or for each piece of music.

However, it is also possible, as is provided in the case of a second embodiment, to store the items of data from the first m revolutions where m is an integer or an improper fraction.

In a third embodiment, the number of items of data per group which are placed in the store is dependent on the number of groups that are recorded on the disc.

For the purposes of storing the first m items of data, there is provided in the case of a fourth embodiment, a fast store of low capacity as an intermediate store and a resident store. During the storage process, the items of data read by the scanning device are initially placed in the fast store and are passed from there to the resident store. When reading out the items of data, one proceeds in the reverse sequence. The items of data are initially conveyed from the resident store into the fast store from where they are then read out. The advantage of the fourth embodiment is that only a relatively small fast storage module is required.

In the case of a CD player, it is sensible not to store the positions of the discs having the index 0 because they do not contain any items of data. Instead, the length of the pauses

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defined by the indices 0 are stored. The items of data occurring at the beginning of a piece of music, which are zero, are likewise not stored; however, in a similar manner as for the case of the pauses, the duration of these items of data, which do not contain any items of information, is stored.

The method in accordance with the invention is suitable for recording and/or reproduction equipment which are equipped with a recording medium on which the recorded items of data are divided into groups. As examples, CD players, video players, DRAW disc players and magneto-optical equipment come into consideration..

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Claims

1. Method of shortening the access time when using a recording medium (CD) on which the recorded items of data are divided into groups, characterised in that, the first n items of data of each group are initially stored in a store (S) after the recording medium (CD) has been inserted into a recording and/or reproduction equipment, that upon reading the items of data of a group, the items of data that have been placed in the store (S) are read-out first, during which time, the scanning device (A) of the recording and/or reproduction equipment searches for this group, that after this group has been found, the items of data that have been placed in the store (S) are no longer read-out but instead, the items of data delivered by the scanning device (A) are read out.

2. Method of shortening the access time when using a recording medium (CD) on which the recorded items of data are divided into groups, characterised in that, the first n items of data from a portion of the groups are initially stored in a store after the recording medium has been inserted into a recording and/or reproduction equipment, that upon reading the items of data of a group, the items of data that have been placed in the store are read-out first, during which time, the scanning device of the recording and/or reproduction equipment searches for this group, that after this group has been found, the items of data that have been placed in the store are no longer read-out but instead, the items of data delivered by the scanning device are read out and that the first n items of data of the remaining groups are stored in the store in the pauses between reading the items of data of the second groups.

3. Method in accordance with Claim 1 or 2, characterised in that, after the flow of data coming from the store (S) is synchronised with the flow of data coming from the scanning device (A), the items of data read-out from the store (S) are no longer passed on for further processing but, the items of data delivered by the scanning device (A) are passed on instead.

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4. Method in accordance with Claim 1, 2 or 3, characterised in that, the recording medium is a disc (CD).

5. Method in accordance with Claim 4, characterised in that, the items of data for at least one revolution of the disc are stored in the store (S) in the case of each group.

6. Method in accordance with Claim 1, 2, 3, 4 or 5, characterised in that, the number n depends on the number of groups which are recorded on the recording medium (CD).

7. Method in accordance with Claim 1, 2, 3, 4, 5 or 6, characterised in that, there are provided a fast store acting as an intermediate store and a resident store for storing the first n items of data of each group, that the items of data are initially placed in the intermediate store and thereafter are passed on to the resident store and that read out of the items of data occurs in the inverse sequence.

8. Method in accordance with Claim 1, 2, 3, 4, 5, 6 or 7, characterised in that, items of data having the index 0 are not stored in the case of a CD player.

9. Method in accordance with Claim 8, characterised in that, the duration of the pauses is stored.

10. Arrangement for carrying out the method in accordance with Claim 1, 2, 3, 4, 5, 6, 7, 8 or 9, characterised in that, a scanning device (A), which scans the recording medium (CD), is connected to the first input of a synchronising circuit (SY) whose output is connected to the store (S), that the output of the store (S) is connected to the second input of the synchronising circuit (SY) from whose output the items of data are derivable and that a control circuit (ST) is connected to the scanning device (A).

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Abstract

1. Method of shortening the access time when using a recording medium on which the recorded items of data are divided into groups.

2.1 If a person using a CD wishes to listen to a particular piece of music on a CD then he has to wait through the so-called access time until the scanning device has found the wanted piece of music and the play-back process can be begun.

2.2 In order to considerably shorten the access time in a recording and/or reproduction equipment including a recording medium on which the items of data are divided into groups, the first n items of data of each one of the groups are initially placed in a store (S) after the recording medium has been inserted. When it is intended to read the items of data of a certain group, the items of data of this group, which have been placed in the store (S), are read-out first. Meanwhile, the scanning device (A) of the equipment has sufficient time to search for the group. When the scanning device (A) has found the group and the flow of data coming from the store (S) is synchronised with that from the scanning device (A), the items of data delivered by the scanning device (A) are read-out. The access time is thereby shortened to a value of virtually zero.

2.3 CD players, video players, DRAW disc players and magneto-optical equipment.

3. Figure.

This Sheet Has Been Replaced

REPLACEMENT SHEET
15 MAR 2000

METHOD OF SHORTENING THE ACCESS TIME

The invention relates to a method of shortening the access time when using a recording medium.

In a CD player, an optical scanning device scans the items of data in a rotating disc-shaped recording medium, the so-called compact disc, by means of a light beam. The light beam scanning the items of data is guided along the spiral-like data tracks on the disc by means of a tracking control loop.

In order for someone using a CD to be able to listen to a piece of music that he wants to hear, the optical scanning device is guided as quickly as possible from its present position to the track on which the wanted piece of music begins. During this process, which will be referred to as track-jumping, the light beam crosses a plurality of data tracks; it jumps from the track that is currently being scanned to the target track. The quicker the track-jumping, the shorter the access time, the time that the user must wait until he can hear the wanted piece of music.

Short access times are of much greater significance in a data system than in the case of a CD player. In a recording and/or reproduction equipment which is equipped with a CD-ROM as a data store, short access times are a basic indication of the quality. The access time may vary between approximately 100 msecs and some seconds in dependence on the equipment and the disc.

Consequently, the object of the invention is to considerably shorten the access time.

The invention, a method of shortening the access time when using a recording medium in which the recorded items of data are divided into groups, achieves this object in that, the first n items of data of each group are initially stored in a store after the recording medium has been inserted into a recording and/or reproduction equipment, that upon reading the items of data of a group, the items of data that have been placed in the store are read-out first, during which time, the scanning device

REPLACEMENT SHEET
15 MAR 2000

of the recording and/or reproduction equipment searches for this group, that after this group has been found, the items of data that have been placed in the store are no longer read-out but instead, the items of data delivered by the scanning device are read out.

A second way of achieving this object envisages that the first n items of data from a portion of the groups are initially stored in a store after the recording medium has been inserted into a recording and/or reproduction equipment, that upon reading the items of data of a group, the items of data that have been placed in the store are read-out first, during which time, the scanning device of the recording and/or reproduction equipment searches for this group, that after this group has been found, the items of data that have been placed in the store are no longer read-out but instead, the items of data delivered by the scanning device are read out and that the first n items of data of the remaining groups are stored in the store in the pauses between reading the items of data from the second groups.

An arrangement for carrying out the method in accordance with the invention is shown in the Figure.

The invention will now be described and explained in exemplary manner with the help of the Figure and a CD player.

When a disc CD is inserted into the CD player, a control circuit ST initially causes an optical scanning device A, which scans the disc CD using a light beam L, to go successively to the beginning of each one of the pieces of music in order to read the first n items of data of each one of the pieces of music. These first n items of data of each one of the pieces of music are then stored in a store S. When the process of storing the first n items of data of each group in the store S is over, the CD player is ready to function. The disc can now be played back.

If the person using a CD wishes to listen to a piece of music for example, then the read out of the first n items of data of this piece of music that have been placed in the store S is

REPLACEMENT SHEET
15 MAR 2000

immediately begun, the optical scanning device meanwhile searching the disc CD for the beginning of the piece of music which is wanted by the listener. A synchronising circuit SY passes on the items of data that have been read from the store S. Meanwhile, the control circuit ST moves the optical scanning device A to the beginning of the wanted piece of music on the disc CD so that the reading of the items of data from the disc CD can be begun. The flow of data coming from the store S is synchronised with the data flow from the optical scanning device A in the synchronising circuit SY. As soon as the two data streams are synchronised, the synchronising circuit SY no longer passes on the items of data coming from the store S but rather, the items of data delivered by the optical scanning device A.

The user immediately hears that piece of music which he wants, because the first n items of data of each one of the pieces of music have been placed in a store. The access time has become virtually zero. The optical scanning device has sufficient time to search the disc for the wanted piece of music while the items of data are being read out from this store S. After the items of data coming from the store and the items of data delivered by the scanning device are synchronised, there is a change over to the items of data delivered by the scanning device. The listener does not notice this switching process.

It is quite sufficient to store the first n items of data from only a portion of the groups or the pieces of music in order to achieve a shortening of the access timees. The access times for those groups whose first n items of data have been placed in the store are shortened; the access times for the remaining groups however are not shortened.

In accordance with the second solution in accordance with the invention, the first n items of data from only a portion of the groups or pieces of music are initially stored. The first n items of data from the remaining pieces of music are stored during the pauses between two pieces of music and while the CD player is in the pause mode.

REPLACEMENT SHEET
15 MAR 2000

However, instead of the individual pieces of music, one may be concerned with other groups of arbitrary data items. The recorded items of data may, for example, be divided into a plurality of groups on a CD-ROM, a once writable compact disc.

The first n items of data from each group are stored in the store after the disc has been inserted. It is useful to choose n to be large enough for the scanning device to have sufficient time on each occassion to find the beginning of those groups whose items of data it is intended to read. However, it is not necessary to place the same number of items of data in the store for each group.

In the case of a first embodiment of the invention, provision is made for storing the items of data from the first revolution for each group or for each piece of music.

However, it is also possible, as is provided in the case of a second embodiment, to store the items of data from the first m revolutions where m is an integer or an improper fraction.

In a third embodiment, the number of items of data per group which are placed in the store is dependent on the number of groups that are recorded on the disc.

For the purposes of storing the first m items of data, there is provided in the case of a fourth embodiment, a fast store of low capacity as an intermediate store and a resident store. During the storage process, the items of data read by the scanning device are initially placed in the fast store and are passed from there to the resident store. When reading out the items of data, one proceeds in the reverse sequence. The items of data are initially conveyed from the resident store into the fast store from where they are then read out. The advantage of the fourth embodiment is that only a relatively small fast storage module is required.

In the case of a CD player, it is sensible not to store the positions of the discs having the index 0 because they do not contain any items of data. Instead, the length of the pauses

REPLACEMENT SHEET
15 MAR 2000

defined by the indices 0 are stored. The items of data occurring at the beginning of a piece of music, which are zero, are likewise not stored; however, in a similar manner as for the case of the pauses, the duration of these items of data, which do not contain any items of information, is stored.

The method in accordance with the invention is suitable for recording and/or reproduction equipment which are equipped with a recording medium on which the recorded items of data are divided into groups. As examples, CD players, video players, DRAW disc players and magneto-optical equipment come into consideration..

* C L M S *

REPLACEMENT SHEET
15 MAR 2000

Claims

1. Method of shortening the access time when using a recording medium (CD) on which the recorded items of data are divided into groups, characterised in that, the first n items of data of each group are intially stored in a store (S) after the recording medium (CD) has been inserted into a recording and/or reproduction equipment, that upon reading the items of data of a group, the items of data that have been placed in the store (S) are read-out first, during which time, the scanning device (A) of the recording and/or reproduction equipment searches for this group, that after this group has been found, the items of data that have been placed in the store (S) are no longer read-out but instead, the items of data delivered by the scanning device (A) are read out.

2. Method of shortening the access time when using a recording medium (CD) on which the recorded items of data are divided into groups, characterised in that, the first n items of data from a portion of the groups are initially stored in a store after the recording medium has been inserted into a recording and/or reproduction equipment, that upon reading the items of data of a group, the items of data that have been placed in the store are read-out first, during which time, the scanning device of the recording and/or reproduction equipment searches for this group, that after this group has been found, the items of data that have been placed in the store are no longer read-out but instead, the items of data delivered by the scanning device are read out and that the first n items of data of the remaining groups are stored in the store in the pauses between reading the items of data of the second groups.

3. Method in accordance with Claim 1 or 2, characterised in that, after the flow of data coming from the store (S) is synchronised with the flow of data coming from the scanning device (A), the items of data read-out from the store (S) are no longer passed on for further processing but, the items of data delivered by the scanning device (A) are passed on instead.

REPLACEMENT SHEET
15 MAR 2000

4. Method in accordance with Claim 1, 2 or 3, characterised in that, the recording medium is a disc (CD).

5. Method in accordance with Claim 4, characterised in that, the items of data for at least one revolution of the disc are stored in the store (S) in the case of each group.

6. Method in accordance with Claim 1, 2, 3, 4 or 5, characterised in that, the number n depends on the number of groups which are recorded on the recording medium (CD).

7. Method in accordance with Claim 1, 2, 3, 4, 5 or 6, characterised in that, there are provided a fast store acting as an intermediate store and a resident store for storing the first n items of data of each group, that the items of data are initially placed in the intermediate store and thereafter are passed on to the resident store and that read out of the items of data occurs in the inverse sequence.

8. Method in accordance with Claim 1, 2, 3, 4, 5, 6 or 7, characterised in that, items of data having the index 0 are not stored in the case of a CD player.

9. Method in accordance with Claim 8, characterised in that, the duration of the pauses is stored.

10. Arrangement for carrying out the method in accordance with Claim 1, 2, 3, 4, 5, 6, 7, 8 or 9, characterised in that, a scanning device (A), which scans the recording medium (CD), is connected to the first input of a synchronising circuit (SY) whose output is connected to the store (S), that the output of the store (S) is connected to the second input of the synchronising circuit (SY) from whose output the items of data are derivable and that a control circuit (ST) is connected to the scanning device (A).

REPLACEMENT SHEET
15 MAR 2000

ABSTRACT

METHOD OF SHORTENING THE ACCESS TIME

Method of shortening the access time when using a recording medium on which the recorded items of data are divided into groups.

If a person using a CD wishes to listen to a particular piece of music on a CD then he has to wait through the so-called access time until the scanning device has found the wanted piece of music and the play-back process can be begun.

In order to considerably shorten the access time in a recording and/or reproduction equipment including a recording medium on which the items of data are divided into groups, the first n items of data of each one of the groups are initially placed in a store (S) after the recording medium has been inserted. When it is intended to read the items of data of a certain group, the items of data of this group, which have been placed in the store (S), are read-out first. Meanwhile, the scanning device (A) of the equipment has sufficient time to search for the group. When the scanning device (A) has found the group and the flow of data coming from the store (S) is synchronised with that from the scanning device (A), the items of data delivered by the scanning device (A) are read-out. The access time is thereby shortened to a value of virtually zero.

CD players, video players, DRAW disc players and magneto-optical equipment.

Figure.

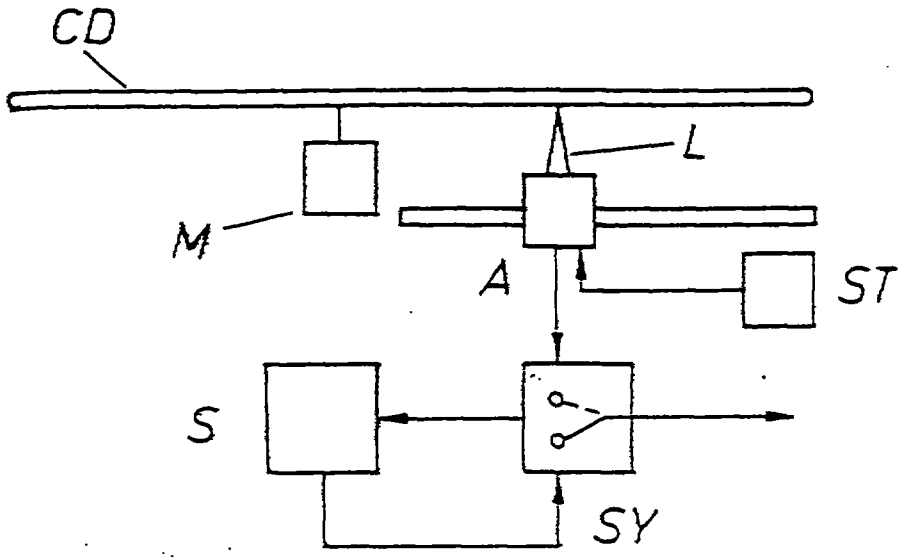


Fig.